# THE
# ONTARIO WATER RESOURCES
# COMMISSION

## WATER RESOURCES SURVEY

DISTRICT OF SUDBURY

A SURVEY OF WATER RESOURCES
AND STREAM POLLUTION WITH
RECOMMENDED PROGRAMS

PART I

1960 to 1963

THE

ONTARIO WATER RESOURCES

COMMISSION

WATER RESOURCES SURVEY

DISTRICT OF SUDBURY

# A SURVEY OF WATER RESOURCES AND STREAM POLLUTION WITH RECOMMENDED PROGRAMS

PART I

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# ABBREVIATIONS

## ENGINEERING TERMS

| | | |
|---|---|---|
| BOD | - | BIOCHEMICAL OXYGEN DEMAND |
| CFM | - | CUBIC FEET PER MINUTE |
| CFS | - | CUBIC FEET PER SECOND |
| GAL | - | GALLONS (IMPERIAL GALLONS USED THROUGHOUT UNLESS OTHERWISE NOTED) |
| GPCPD | - | GALLONS PER CAPITA PER DAY |
| GPD | - | GALLONS PER DAY |
| GPM | - | GALLONS PER MINUTE |
| HP | - | HORSEPOWER |
| MF | - | MEMBRANE FILTER |
| MGD | - | MILLION GALLONS PER DAY |
| ML. | - | MILLILITRES |
| No. | - | NUMBER |
| PPB. | - | PARTS PER BILLION |
| PPM. | - | PARTS PER MILLION |
| S.S. | - | SUSPENDED SOLIDS |

## COMPANIES

| | | |
|---|---|---|
| C.I.L. | - | CANADIAN INDUSTRIES LIMITED |
| CN | - | CANADIAN NATIONAL |
| CPR | - | CANADIAN PACIFIC RAILWAY |
| INCO | - | INTERNATIONAL NICKEL COMPANY OF CANADA LTD. |
| KVPC | - | KALAMAZOO VEGETABLE PARCHMENT CO. |

## CONSERVATION AUTHORITIES

| | | |
|---|---|---|
| JCCA | - | JUNCTION CREEK CONSERVATION AUTHORITY |
| WVCA | - | WHITSON VALLEY CONSERVATION AUTHORITY |

GOVERNMENT AGENCIES

| | | |
|---|---|---|
| DHO | - | Department of Highways of Ontario |
| DPW | - | Department of Public Works (Ontario) |
| HEPC | - | Hydro Electric Power Commission (Ontario) |
| OWRC | - | Ontario Water Resources Commission |
| VLA | - | Veterans' Land Act, Department of Veterans' Affairs (Federal) |

MISCELLANEOUS

| | | |
|---|---|---|
| Hwy. | - | Highway |
| I.D. | - | Improvement District |
| S.T.P. | - | Sewage Treatment Plant |
| Twp. | - | Township |
| WPCP | - | Water Pollution Control Plant |

## SYMBOLS

\# - Number

SVO 97.0 - Stream Sample Point

SVO 97.0 - I - Industrial Waste Outfall

SVO 97.0 - S - Raw Sewage Outfall

SVO 97.0 - T - Treated Sewage Effluent

NOTE - Unless otherwise indicated, all population figures have been obtained from the Department of Municipal Affairs Municipal Directories.

# CHAPTER ONE

## SUMMARY AND RECOMMENDATIONS

# CHAPTER I - SUMMARY AND RECOMMENDATIONS

## I SUMMARY

This report comprises Part I of the survey conducted by the Ontario Water Resources Commission staff during 1960 and 1963. It deals with water resources and stream pollution in the District of Sudbury. Industrial waste disposal practices in the district have been given minimal coverage for the purpose of completion of Part I. However, detailed information and recommendations regarding pollution control for the major industrial concerns will be given in Part II of the survey to be published at a later date.

In this report, attention has been given to the sources of water supply, treatment, distribution, future water requirements and potential additional water supplies for the municipalities. Sanitary waste disposal practices and, in some cases, industrial waste discharges have been examined in order to assess their effect on the quality of the surface waters in the District of Sudbury.

Chapter 2 describes the geographical features of the district and Chapters 3 and 4 discuss the geological and surface water features of the area. Subsequent chapters deal specifically with individual municipalities, and detailed recommendations are made with respect to future water development and pollution control.

Figures and tables are also contained in the body of this report. These visual aids outline the areas serviced by water and sewers, indicate the location of water works and sewage treatment facilities and show the stream sample locations within the organized municipalities. The tables summarize the chemical and bacteriological quality of water supplies, and the sanitary quality of waste water outlets, and streams.

The results of the survey can be summarized as follows:

1. A large portion of the District of Sudbury is unorganized. The unorganized townships which are sparsely populated, comprise approximately 96% of the total acreage of the district. A complete coverage of each unorganized township was considered unnecessary. However, the more developed townships have been discussed. As a community grows municipal organization becomes desirable to cope with the problems that can best be solved by concerted effort. Without municipal organization, improvements of existing conditions can only be obtained by individual action.

2. Municipal water works systems serve more than 75% of the population in the District of Sudbury. A number of municipalities are in need of water works systems. Growth of these municipalities will be closely associated with the availability of adequate supplies of water.

3. Good ground water supplies from overburden and bedrock formations in the District of Sudbury are a valuable natural resource. The larger municipal and industrial wells are drilled

wells of large diameter which obtain water from sand and gravel deposits. Municipalities using ground water for all or part of their water works supply are, the City of Sudbury, the Town of Capreol, the Town of Levack, the Township of Falconbridge, the Townships of Neelon and Garson, and the Improvement District of Onaping. Falconbridge Nickel Mines Ltd. and International Nickel Mines of Canada Ltd. use ground water at a number of their mines and plants.

4. In the plains areas of the district, most homes obtain water supplies by means of well points and dug wells utilizing ground water under water-table conditions. Throughout much of the district the water table is high. Domestic sewage disposal in the plains region is effected by individual septic tanks and pit privies. Seepage from these installations during the spring run-off period may percolate to the raised water table and cause pollution of shallow wells. This further emphasizes the need for the development of municipal water works and sewerage works systems.

5. Private sewage disposal systems in the developed areas of the district are under the supervision of the Sudbury and District Health Unit. Sanitary conditions in the remote areas are supervised by the Ontario Department of Health, Industrial Hygiene Branch. The use of septic tank disposal systems will require continued supervision to control sanitary conditions where private systems are employed.

6. Industrial operations in the District of Sudbury are primarily associated with the mining industry. There are 17 mines located in the area. Fifteen produce a copper-nickel ore with some associated pyrrhotite. One mine obtains iron ore through open pit operations and there is one gold mine. International Nickel Company of Canada Ltd. operates eight of the copper-nickel mines, and Falconbridge Nickel Mines Ltd. operates seven. Lowphos Ore Company Ltd. operates the open pit iron mine, while Renabie Gold Mines Ltd. runs the gold mine.

INCO operates three concentrators located in Copper Cliff, Levack, and the Townships of Creighton and Snider, as well as two smelters at Copper Cliff and Coniston. An iron ore recovery plant producing a high grade pelletized iron ore and a copper refinery are also operated by INCO in Waters Township and Copper Cliff respectively.

Falconbridge Nickel Mines Ltd. operates three concentrators, one in Falconbridge Township, and two in Onaping I.D. This company also operates a smelter and pyrrhotite concentrator in Falconbridge Township.

At the Lowphos open pit mine in Hutton Township, milling and pelletizing of iron ore is also carried out.

Other operations of major importance in the area include, forestry, transportation and acid-producing industries.

The KVP Co.Ltd. at Espanola utilize the pulpwood production of large Crown Limits as well as privately produced wood.

The main lines of the Canadian National and the Canadian Pacific Railway pass through the Sudbury Basin. The CN has its dividional office, diesel fueling and watering station located in the Town of Capreol. The CPR has service facilities located in Cartier and a divisional office and repair depot at Chapleau.

Liquid sulphur dioxide and sulphuric acid are produced at two plants owned by Canadian Industries Ltd. in Copper Cliff and Waters Township.

The remaining industries with significant waste discharges are primarily service industries located in the City of Sudbury. Several dairies, a brewery and a plating shop are included.

7. The concentrations of metal ions found in many of the waters in the Sudbury area are sufficient to be acutely toxic to fish and other aquatic life.

## II RECOMMENDATIONS

The recommendations concerning municipal water supply and sewage disposal follow. Recommendations concerning the treatment and disposal of industrial wastes will be presented in the second part of this report to be issued at a later date after further study and sampling have been carried out.

### CITY OF SUDBURY

(a) Ground-water resources should be utilized to supply increasing water demands in the recently annexed portions of Neelon Township.

(b) The municipality should continue to exert control over the sanitary disposal of waste water within the Ramsey Lake and

Trout Lake Watersheds.

(c) Consideration should be given to the construction of a sewage treatment plant to reduce the pollution load on Junction Creek.

(d) The hops from Doran's Northern Ontario Breweries Ltd. should be removed from the sewered waste and disposed of separately.

(e) Improved sewage treatment facilities should be provided at the INCO installations at Murray Mine and Frood-Stobie Mines.

TOWN OF CAPREOL

(a) Iron removal treatment should be provided on the municipal wells.

(b) The Town of Capreol should provide the sewage lagoon as approved by the OWRC in 1961.

TOWN OF CHELMSFORD

(a) Increased sedimentation and filtration capacity should be provided at the water works to meet future water demands.

TOWN OF CONISTON

There are no recommendations at this time regarding water or sewage works for this municipality.

TOWN OF COPPER CLIFF

There are no recommendations at this time regarding water or sewage works for this municipality.

TOWN OF ESPANOLA

There are no recommendations at this time regarding water or sewage works for this municipality.

TOWN OF LEVACK

(a) Ground-water resources should be utilized when development of additional water supplies is required.

(b) The staged program to provide adequate sewage treatment, as outlined in the Proctor & Redfern report, should be pursued.

TOWN OF LIVELY

(a) Adequate sewage treatment facilities should be provided.

TOWN OF MASSEY

(a) Consideration should be given to the provision of elevated water storage.

TOWN OF WEBBWOOD

(a) A municipal water works should be constructed, preferably from ground-water sources. In this respect, the ground-water potential could be determined by a test-drilling program.

TOWNSHIPS(Organized)

TOWNSHIP OF BLEZARD

(a) A water works system should be initiated to serve the community of Val Caron and it should be designed to provide future expansion to serve the Blezard Valley and McCrea subdivision areas.

(b) Test drilling should be carried out to determine the feasibility of obtaining water from ground-water sources.

(c) A system of sanitary sewers, and an oxidation pond, as outlined in the Dillon & Lewis report, should be constructed to serve the Val Caron area making provision for expansion to include the Blezard Valley and McCrea subdivision areas.

TOWNSHIP OF CAPREOL

(a) A municipal water works system should be initiated for the community of Hanmer and the surrounding development.

(b) Test drilling should be carried out to determine the feasibility of tapping ground-water sources.

(c) The lagoon system presently planned for the portion of the hamlet of Hanmer within Capreol Township should be extended to serve that portion located in Hanmer Township.

TOWNSHIPS OF CASIMIR, JENNINGS & APPLEBY

(a) Action should be taken by the residents of St. Charles to provide satisfactory individual sewage disposal systems.

TOWNSHIP OF CHAPLEAU

(a) A ground-water test-drilling program should be undertaken to determine the feasibility of using ground water to supply Chapleau.

(b) The CPR should take remedial measures to prevent the discharge of oil to the Nebskwashi River.

(c) The sewage treatment plant efficiency should be improved, and the plant effluent should be chlorinated during the summer months.

(d) Adequate sewage disposal facilities should be provided in the unsewered north-west section of Chapleau.

TOWNSHIPS OF COSBY, MASON & MARTLAND

(a) An effective program should be instituted to ensure the proper construction of new tile bed systems where individual disposal systems are unsatisfactory.

TOWNSHIP OF DOWLING

(a) Ground-water investigations should be carried out in the Larchwood area in preparation for the development of a communal water supply to meet the needs of the expanding population.

TOWNSHIP OF FALCONBRIDGE

(a) Consideration should be given to refinement of domestic sewage treatment.

TOWNSHIP OF HANMER

(a) A municipal water supply system should be developed from ground-water sources for the various subdivisions in Hanmer Township along Highway #69.

(b) A water supply for the portion of the community of Hanmer within Hanmer Township should be developed in conjunction with that portion of the hamlet in Capreol Township.

(c) The southern subdivisions along Highway #69 should develop water supplies in conjunction with Val Caron.

(d) The systems should be designed to facilitate interconnection as the population density of the township increases.

(e) The portion of the community of Hanmer within Hanmer Township should consider connection to the sewerage system presently being planned to serve that portion within Capreol Township.

(f) The more southerly subdivisions should develop sewerage systems in conjunction with Val Caron in Blezard Township.

TOWNSHIP OF NAIRN

(a) Consideration should be given to providing a communal water works system for Nairn Centre.

TOWNSHIPS OF NEELON & GARSON

(a) The present sewerage system should be operated until such a time that trunk sewers from the City of Sudbury are extended to serve this region.

TOWNSHIPS OF RATTER & DUNNET

(a) Action should be taken to correct defective septic tank systems.

TOWNSHIP OF RAYSIDE

(a) A communal water works system should be provided for the community of Azilda.

(b) Test drilling investigations should be carried out to determine the feasibility of utilizing ground-water resources.

(c) A sewerage system should be provided to collect and treat domestic wastes from the community of Azilda.

(d) Consideration should be given to the provision of oxidation pond sewage treatment unit.

IMPROVEMENT DISTRICTS

ONAPING I.D.

(a) Future water demands should be satisfied, first, from the available ground-water resources, and secondly, from the Onaping River upstream of Levack or Windy Lake.

RENABIE I.D.

(a) A physical break should be made in the existing cross

connection between the Renabie Lake and Campbell Lake water systems.

(b) The proposed lagoon should be constructed to serve Renabie townsite and mine.

TOWNSHIPS (Unorganized)

TOWNSHIP OF BRODER

(a) Protection of the water quality of Long Lake should be provided by the installation of suitable septic tank and tile bed systems for the residential development around the shores of the lake.

TOWNSHIP OF CARTIER

(a) Consideration should be given to the development of a communal water works system to serve the residents of Cartier.

TOWNSHIPS OF CREIGHTON & SNIDER

(a) Consideration should be given to the provision of improved sewage treatment facilities to serve the townsite of Creighton and the mining operations.

TOWNSHIP OF CURTIN

(a) Discharges from leaching wells or filter beds should be prevented from gaining access to Frood Lake.

TOWNSHIP OF DRYDEN

(a) A community water works system should be established to serve the residences in Wanapitei.

(b) Action should be taken by the offending individuals or by the community of Wanapitei to prevent the discharge of sewage to roadside ditches or the Wanapitei River.

TOWNSHIP OF HUTTON

There are no recommendations at this time.

TOWNSHIP OF LAURA

(a) Consideration should be given to either utilizing ground water or providing more refined water treatment at Burwash Industrial Farm, Camp Two.

(b) Improved treatment should be provided for the water supply at Burwash Industrial Farm, Camp Bison.

(c) An alternate source should be located for Burwash Industrial Farm, Camp Spruce, to insure that a sufficient quantity of water is available throughout the year.

(d) Consideration should be given to increasing storage facilities at all three camps.

(e) The dairy, slaughter house, and stables should be connected to the Camp Two sewerage system.

TOWNSHIP OF NOBLE

(a) Consideration should be given to the provision of a communal water works system for the community of Gogama.

(b) Septic tank effluent should be discharged to sub-surface tile beds rather than to cesspools.

# CHAPTER TWO

## GEOGRAPHY

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# CHAPTER 2 - GEOGRAPHY

## I LOCATION

The District of Sudbury has an area of 18,058 square miles lying north of the French River in northern Ontario. It is adjoined on the east by the Districts of Nipissing and Timiskaming, on the north by the Districts of Cochrane and Algoma, and on the west by the District of Algoma. Good transportation facilities are provided by the Canadian National and Canadian Pacific Railways which cross the southern part of the district and extend from the south-east to the north-west sections. Major road access is provided by Highways #17 and #69 in the south and Highways #129 and #616 in the north. Trans-Canada Airlines provides regular service to the City of Sudbury. Charter aircraft are available for transportation to other localities. Key Harbour in the District of Parry Sound is an important lake port for the Sudbury area.

## II TOPOGRAPHY AND DRAINAGE

Bedrock hills and ridges with drift filled valleys are a characteristic feature of the area. The bedrock exerts a major control on topography and the rock ridges generally follow the strike of the bedrock formations. Faults and basic dykes generally are weathered to form linear depressions. The valleys and low-lying areas are filled with clay, silt, sand, and gravel deposited during the glacial epoch in rivers, lakes, and outwash plains. Eskers and crevasse fillings form elongated ridges. Locally ice margins and fronts are marked by lateral and recessional moraines. Ground

moraine is frequently masked by later water-laid deposits and not readily distinguished.

In the Sudbury Basin and most of the country south of Highway #17, elevations are less than 1,000 feet. The rocks of the Sudbury Nickel Irruptive form hills with a maximum relief of about 500 feet. To the north-west, the elevation of the land increases gradually to a little more than 2,000 feet near the headwaters of the Batchawana River but the relief seldom exceeds 400 feet. The Hudson Bay Watershed divide crosses the district in an arcuate pattern near latitude 47° 30'.

The District of Sudbury is divided into two main drainage areas, namely, James Bay and the St.Lawrence River. The St.Lawrence River drainage area may be further subdivided into two secondary drainage areasmay be further subdivided into two secondary drainage areas, one tributary to the Great Lakes - lakes Huron and Superior - the other tributary to the Ottawa River.

The drainage of the district is disordered and poorly integrated, containing many lakes, large and small, and meandering streams. The height-of-land, which separates the rivers flowing northerly to James Bay from those flowing southerly to the St.Lawrence River, traverses the district. That many of the streams have their headwaters in the district is attributed to this feature.

The largest area of the district is that which drains to the St.Lawrence. This area represents approximately 60 per cent of the total 18,058 square mile district area. The remaining 40 per cent is that area which drains to James Bay.

The drainage pattern for the district is shown on Figure 2-1.

## III CLIMATE

The District of Sudbury has a temperate summer and a moderately severe winter. Annual precipitation and snowfall are not markedly different from that occurring in southern Ontario.

Weather observations at five communities are shown in Climatic Summaries for Selected Meteorological Stations in the Dominion of Canada, Vol.I. The stations are Biscotasing, Chapleau, Ruel, Sudbury, and Turbine. The averages for these stations indicate a summer day-time temperature in the 70's and a winter day-time temperature between 10° and 20°. The average daily temperature for January and February is below zero. The annual average daily maximum temperature is 48° and the annual average daily minimum temperature is 25°. The City of Sudbury has the warmest climate of the five stations, and temperatures generally decrease to the north-west.

The annual average precipitation is 29 inches. The least precipitation falls in February and the most falls in September. The annual snowfall averages 82 inches. The City of Sudbury is favoured with the smallest average snowfall of 72.5 inches, whereas Chapleau has the largest with 92.6 inches.

## IV POPULATION

The present population of the district is 149,735. In the 15-year period from 1948 to present the population of the district has more than doubled from 69,655. The most rapid rate of growth took place during the period after the war up to 1950, with annual increases as high as 9 per cent. For most of the 1950's, annual increases averaged approximately 5 per cent. In recent years increases of approximately 2.5 per cent have been experienced. The provincial growth rate is presently about 2 per cent annually.

Population study curves for the district and its municipalities are shown in figures 2-2, 2-3, and 2-4. Population figures are shown from 1935 to date, where available, and population projections to the year 2000. The projections for the district, the City of Sudbury, the towns and urban townships are based on an annual increase of 2.5 per cent, the projections for the rural townships are based on an annual increase of 2.0 per cent. These population projections are intended only as an indication of potential growth. Because of the nature of the district's economy-based principally on mining operations - these rates may again change markedly within a few years.

## V INDUSTRY

The location of industry in the territorial district of Sudbury has been dictated by the need for developing basic processing units at the sources of raw materials, rather than by the attention of secondary industries, market for produce goods,

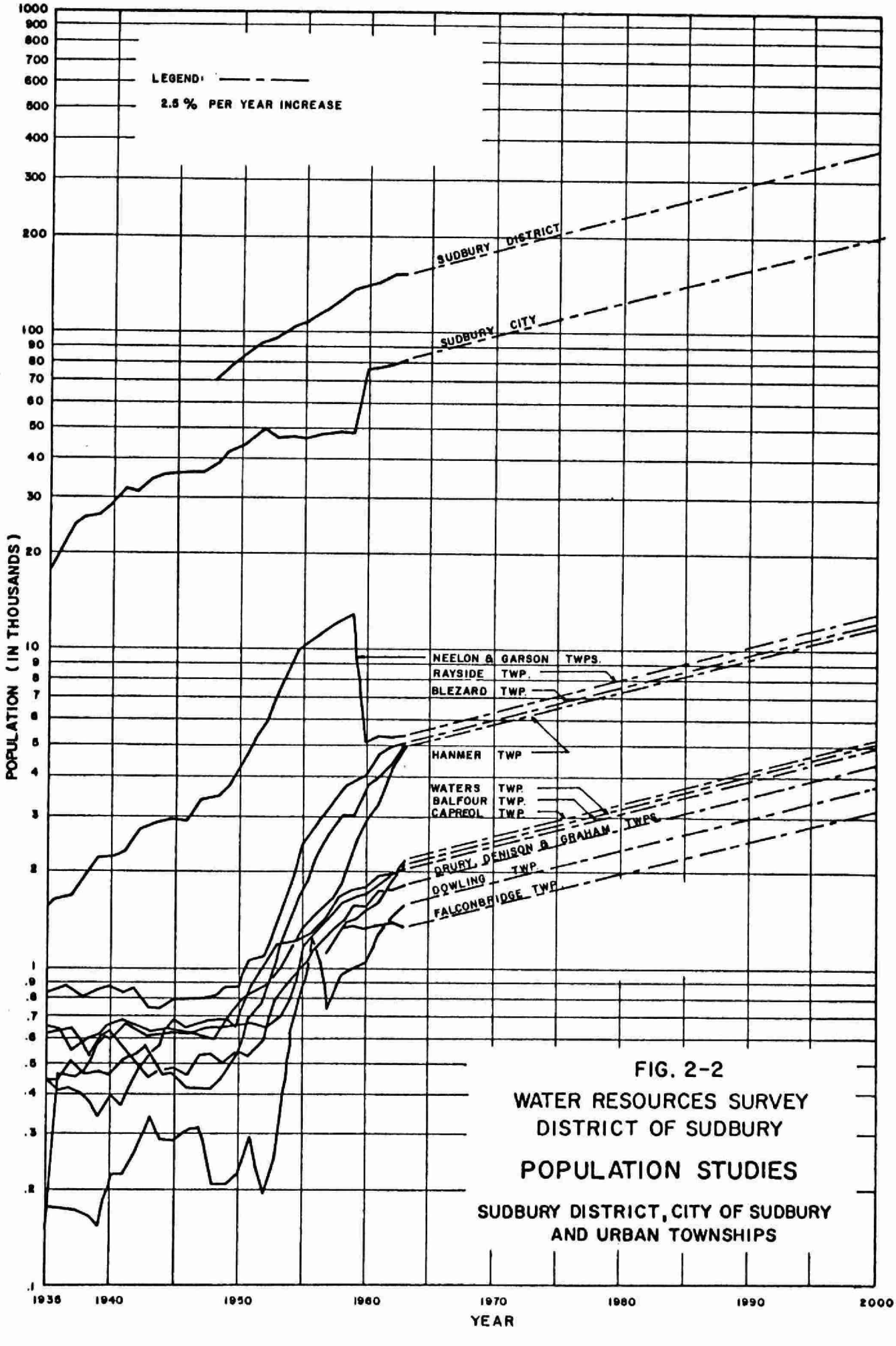


FIG. 2-2

WATER RESOURCES SURVEY
DISTRICT OF SUDBURY

## POPULATION STUDIES

SUDBURY DISTRICT, CITY OF SUDBURY
AND URBAN TOWNSHIPS

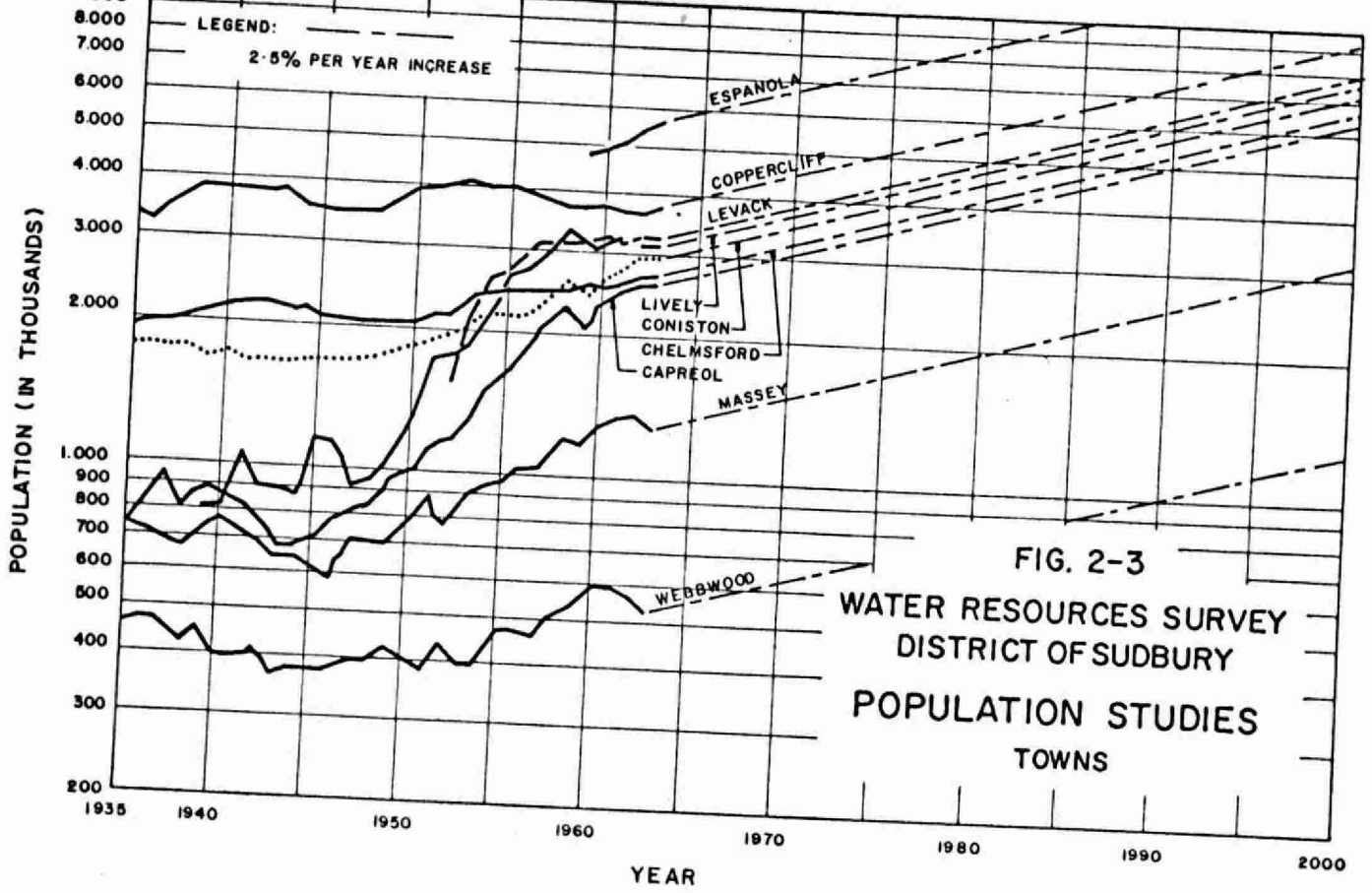


FIG. 2-3

WATER RESOURCES SURVEY
DISTRICT OF SUDBURY

POPULATION STUDIES

TOWNS

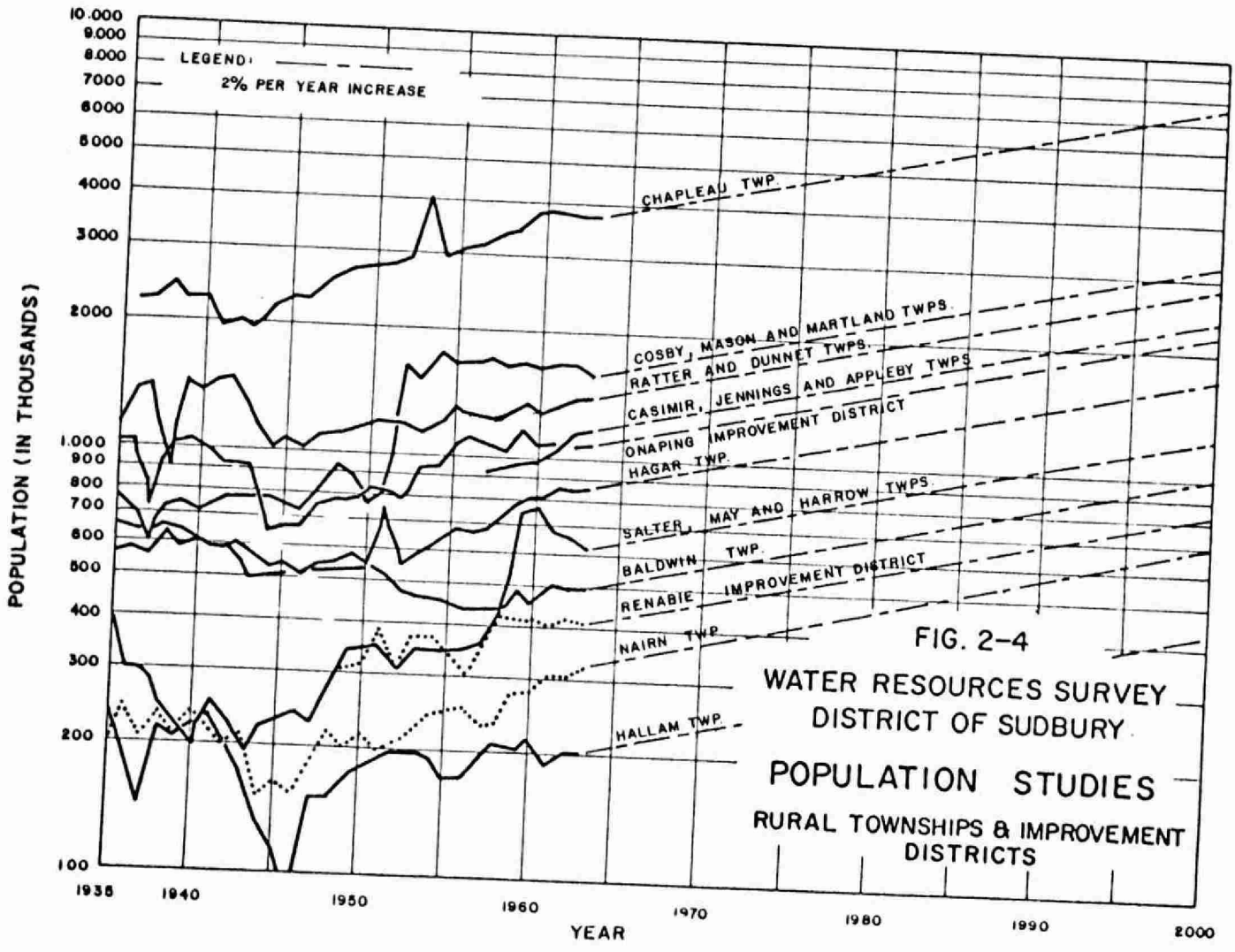


FIG. 2-4

WATER RESOURCES SURVEY
DISTRICT OF SUDBURY

POPULATION STUDIES

RURAL TOWNSHIPS & IMPROVEMENT DISTRICTS

availability of labour, or other factors which so often affect the location of industries in southern Ontario and elsewhere. With the exception of the Spanish River, on which is located the KVP Company Ltd. watercourses or drainage have had very little influence on the locations of industry since much of the industrial development has been in the mining field where the source of raw minerals dictates the location of the industry.

## VI AGRICULTURE

The plains region of the southern portion of the District of Sudbury supports mixed farming enterprises. Many of the farmers supplement their farm income by working in the basic industries of the area. Within the mixed farming base, some specialization has taken place so that dairy and beef farming predominate in the western part of the district. Dairy farming predominates in the south-east and potato farming predominates in the Sudbury basin. Within the basin much farm land is being subdivided for the building of new homes.

The Department of Agriculture pays a subsidy on farm wells costing over $200 and the Department of Public Works contributes largely to the cost of approved drainage projects. At present, negligible irrigation is practised within the district.

# CHAPTER THREE

## GEOLOGY AND GROUND WATER

# CHAPTER 3 - GEOLOGY AND GROUND WATER

## I GENERAL GEOLOGY

### 1. Bedrock

The District of Sudbury lies within the Precambrian Shield and a great variety of rocks are found in the large area covered by the district. (Figure 3-1). A band of varying widths of Proterozoic sedimentary rocks and basic intrusives runs north-east from Whitefish Falls, past Sudbury to Lake Wanapitei where it widens out to cover much of the eastern part of the district. A band of Archean sedimentary rocks and derived metamorphic equivalents parallels the Proterozoic formations from Massey to Garson. The Sudbury nickel irruptive and the associated sedimentary and volcanic rocks of the Sudbury basin lie north of the Proterozoic sediments. Acid intrusives and granitic gneisses with sedimentary bands form the bedrock in the south-east and in much of the north-west areas of the district. A large area of Archean volcanic, sedimentary, and derived metamorphic rocks is found near Gogama, Sultan, and Kukatush. Archean volcanics are present too in the extreme north corner of the district.

Mining is a major industry in the district. Large nickel-copper orebodies are mined in the Sudbury nickel irruptive, gold is mined at Renabie in the north-west belt of volcanics and extensive prospecting and sporadic mining have been carried out in the Gogama-Sultan-Kukatush Archean volanics and sediments and in the Massey-Garson belt of Archean sediments.

2. Pleistocene and Recent

Clay, silt, sand, and gravel were deposited in the river valleys and plain regions of the district by the water of glacial rivers and lakes. Kame moraines, eskers, and ice crevasse fillings, deposited by glacial meltwaters, are common in many sections. Lateral and end moraines mark the boundaries of former ice sheets. Ground moraine is frequently masked by later water-laid deposits.

The silt, sand and gravel, and kettle lakes, extending south-west from Lake Wanapitei to south of Highway 17, represents glacial outwash deposited by water flowing off a retreating ice sheet. The Sudbury basin was probably occupied by stagnant ice during the formation of this deposit. Close to the height of land there are beach sands and gravels which were deposited along the shores of glacial lakes Algonquin and Barlow-Ojibway. The Vermilion River placers are believed to have formed along one of the outlets of Lake Barlow-Ojibway. The Onaping River is also believed to have been an outlet for this former glacial lake. Extensive plains in the south were deposited in glacial Lake Algonquin.

II GROUND WATER

1. Occurrence

Most ground water is supplied by infiltration of normal precipitation into the overburden and bedrock. The ground water moves through pore spaces, fractures, and fault zones in the formation to pass gradually from points of higher elevation to

those of lower elevation. Fine grained materials such as clay, silt, and shale act as barriers to the free flow of water and are termed impermeable materials. If water confined by an overlying impermeable formation rises up in a well above the bottom of the impermeable material it is under artesian conditions. If the water is found in a permeable formation which extends directly to the ground surface and the water does not rise about the level at which it is encountered, it is under water-table conditions.

In the District of Sudbury, the large capacity wells obtain their water from sand and gravel deposited by waters released during the retreat of the Pleistocene glaciers. The largest capacity wells have been developed in sands and gravels located on the banks of lakes and rivers. Finer grained sands in many of the plains areas provide moderate quantities of water adequate for domestic and stock needs. In general the bedrock formations also supply moderate quantities of water adequate for most domestic and stock needs.

2. Availability and Extraction

Ground water is made available for use by natural discharge to surface water bodies and springs and by artificial discharge from wells. Only a few springs were mentioned as sources of supply in the Sudbury area. Wells supply water for many private residences and for a number of municipal and industrial systems.

In the plains areas of the district most homes obtain water supplies by means of well points, which in common with most dug

wells of the area, utilize ground water under water-table conditions. Throughout much of the district the water table is high. The disposal of sewage in septic tanks and pit privies and the occurrence of spring floods in parts of the area are potential sources of pollution to the shallow wells. The danger of pollution will increase with increasing population in the plains areas.

Drilled wells ending in sand and gravel, or rock, supply many homes in the area. Where the overburden is reasonably thick, such wells usually supply fresh water, however, in areas of thin overburden the wells are susceptible to pollution from sewage disposal. In the Sudbury district, most of the private, drilled wells are of small diameter, usually 2 inches or less.

The large municipal and industrial wells are drilled wells of large diameter which obtain water from sand and gravel deposits. Municipalities using ground water for all or part of their water works supply are the City of Sudbury, the Town of Capreol, the Town of Levack, the Township of Falconbridge, the Townships of Neelon and Garson, and the Improvement District of Onaping. Falconbridge Nickel Mines Limited and International Nickel Mines of Canada Limited use ground water at a number of their mines and plants.

3. Water Quality

The quality of ground water in use at most water works systems is satisfactory. Problems are encountered at the Town of Capreol where the iron content is above the recommended maximum of 0.3 ppm.

and at the Falconbridge water works system where the hardness of the water has been increasing in recent years.

The chemical quality of private water supplies is very variable. Much of the water is of satisfactory quality but a number of the supplies have a high iron content that causes staining of plumbing fixtures and partial clogging of pipes. The water at a considerable number of private residences contains some coliform organisms and E.coli have been reported in some instances.

4. Summary

Good ground-water supplies from overburden and bedrock formations in the District of Sudbury are a valuable natural resource. Sand and gravel deposited by glacial meltwaters supply large quantities of fresh water to a number of municipal and industrial water works systems. Such deposits are found in plains, eskers, river valleys, and river terraces throughout much of the district.

The chemical quality of the ground-water supplies is generally satisfactory, although locally high iron content and very hard waters make the supply less satisfactory. Water from a number of private well supplies has shown bacterial contamination, and it is expected that continuing growth of housing in subdivisions serviced by private wells and septic tank disposal systems will increase the incidence of polluted water supplies.

The sand and gravel deposits of the area should be considered as a prime potential source of supply for municipal water works systems. In many localities, ground-water exploration programs should include geophysical methods to aid in the location of sand and gravel aquifers.

# CHAPTER FOUR

## SURFACE WATER

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# CHAPTER 4 - SURFACE WATER

## I GENERAL

The streams and lakes which drain the District of Sudbury have played an important part in the economic development and growth of the district. While the availability of water was not the determining factor in the development of the district's major industry, mining, water has been an important supporting resource. The abundance and proximity of the streams to the major mining centers have allowed the development of low-cost hydro-electric power, as well as providing a supply of water for operations. The pulp and paper industry also depends on readily available water resources for transportation, power and processing. The demands to be placed on water resources in the District of Sudbury will increase, particularly in urban and industrial areas. The recent establishment of two conservation authorities near the population centers is a step forward in the management and protection of the district's water resources.

The major watercourses, streamflows, water uses and conservation activities are discussed in this section. The drainage pattern of the district, stream-gauging stations, hydro-electric power installations and regulating dams are shown on Figure 2-1A.

## II WATERCOURSES

All the streams of the district which are in the James Bay drainage area are tributary to the Moose River. The largest river in the district draining to James Bay is the Mattagami. Its larger tributaries are the Kapuskasing - with minor tributaries, the Chapleau and Nemegosenda Rivers - the Ivanhoe, and Groundhog Rivers. A small portion of the north-west corner of the district is drained by the headwaters of the Missinaibi River. The extreme north-east corner of the district is drained by the headwaters of the Abitibi River.

The headwaters of the Michipicoten, Montreal and Batchawana Rivers drain the western portion of the district to Lake Superior. The Mississagi River drains a relatively small area of the south-west portion of the district to the North Channel of Lake Huron. The Spanish and French Rivers, two of the major rivers of the Lake Huron tributary area, with respect to the area of the district they drain, discharge to the North Channel and Georgian Bay respectively. The larger tributaries of the Spanish are the Vermilion and Onaping Rivers; of the French, the Wanapitei and Sturgeon Rivers. The Sturgeon River drains to the French via Lake Nipissing. Following, in tabular form, are the drainage areas of the major rivers and their tributaries in the three main drainage areas of the district.

TABLE 4 - 1
DISTRICT OF SUDBURY - DRAINAGE AREA

| DRAINAGE AREA | MAIN STREAM | TRIBUTARY OF MAIN STREAM | DRAINAGE AREA WITHIN DISTRICT SQ.MILES | |
|---|---|---|---|---|
| JAMES BAY | MATTAGAMI | | | 6140 |
| | | KAPUSKASING | 1120 | |
| | | IVANHOE | 1120 | |
| | | GROUND HOG | 2030 | |
| | MISSINAIBI | | | 800 |
| | ABITIBI | | | 120 |
| GREAT LAKES | MICHIPICOTEN | | | 520 |
| | MONTREAL | | | 730 |
| | BATCHAWANA | | | 135 |
| | MISSISSAGI | | | 1000 |
| | SPANISH | | | 5030 |
| | | VERMILION | 1590 | |
| | FRENCH | | | 3140 |
| | | STURGEON | 980 | |
| | | WANAPITEI | 1300 | |
| OTTAWA RIVER | MONTREAL | | | 450 |

Other streams mentioned in this chapter are: Junction Creek, Whitson River, the Aux Sables River and the Whitefish River.

## III STREAMFLOW

Within the district are a number of streamflow gauging stations located on streams which drain to Lake Huron. There are gauging stations on the streams which drain portions of the district to James Bay, Lake Superior and the Ottawa River, but none are located within the district. Table 4-2 gives the location, date of installation, drainage area above the gauge, and maximum, average and minimum flows for the gauging stations within the district. Table 4-3 gives similar information for gauges located beyond the district on those streams which drain portions of the district. The discharge at all gauges except the two on the Aux Sables and the Missinaibi is subject to regulation by hydro-power installations.

TABLE 4 - 2

STREAM GAUGING STATIONS WITHIN THE DISTRICT

| STREAM | LOCATION OF GAUGE | DATE INSTALLED | DRAINAGE AREA SQ. MI. | MAXIMUM CFS | FLOW AVG. CFS | MINIMUM CFS |
|---|---|---|---|---|---|---|
| SPANISH | K.V.P. PLANT AT ESPANOLA | 1947 | 4,660 | 24,300 | 4,360 | 113 |
| SPANISH [1] | INCO PLANT AT HIGH FALLS | 1920 | 2,940 | 23,780 | 2,630 | 5 |
| AUX SABLES | CPR BRIDGE AT MASSEY | 1915 | 524 | 7,420 | 650 | 75 |
| VERMILION [1] | INCO PLANT 3 MILES S.E. OF NAIRN | 1918 | 1,570 | 16,600 | 1,630 | 0 |
| FRENCH | CPR STATION AT FRENCH RIVER | 1930 | 5,370 | 20,500 | 6,100 | 1,040 |
| WANEPITEI | 3 MILES SOUTH OF WANUP | 1952 | 1,220 | 8,620 | 1,220 | 353 |

1 - EXCEPT FOR WATER WASTED AT HIGH STAGES, THE ONAPING LAKE DISCHARGE IS DIVERTED FROM THE VERMILION INTO THE SPANISH RIVER.

TABLE 4 - 3

STREAM GAUGING STATIONS BEYOND THE DISTRICT

| STREAM | LOCATION OF GAUGE | DATE INSTALLED | DRAINAGE AREA SQ. MI. | FLOW MAXIMUM CFS | FLOW AVERAGE CFS | FLOW MINIMUM CFS |
|---|---|---|---|---|---|---|
| LAKE SUPERIOR TRIBUTARIES | | | | | | |
| MICHIPICOTEN | GREAT LAKES POWER COMPANY HIGH FALLS PLANT | 1920 | 2,070 | 24,300 | 2,440 | 155 |
| MONTREAL | BELOW GREAT LAKES POWER CO. PLANT AT ALGOMA CENTRAL AND HUDSON BAY RAILWAY BRIDGE | 1920 | 1,100 | 15,290 | 1,390 | 20 |
| LAKE HURON TRIBUTARIES | | | | | | |
| MISSISSAGI | AT RAYNER GENERATING STATION | 1947 | 2,700 | 17,200 | 2,710 | 0 |
| LITTLE WHITE | AT BRIDGE IN THE HAMLET OF BELLINGHAM | 1942 | 780 | 10,400 | 947 | 155 |
| STURGEON | AT CRYSTAL FALLS PLANT OF HEPCO | 1921 | 2,570 | 19,780 | 3,020 | 11 |
| STURGEON | ONE-HALF MILE NW OF AZEN STATION | 1941 | 1,200 | 9,260 | 1,400 | 248 |
| JAMES BAY TRIBUTARIES | | | | | | |
| ABITIBI | AT THE TWIN FALLS PLANT OF THE ABITIBI P & P CO. - 5 MILES SE OF IROQUOIS FALLS | 1945 | 3,810 | 27,800 | 4,560 | 140 |
| MISSINAIBI | AT BRIDGE ON HWY. 11 IN MATTICE | 1920 | 3,450 | 52,250 | 3,600 | 158 |
| MATTAGAMI | AT PLANT OF ABITIBI POWER & PAPER CO. AT SMOOTH ROCK FALLS | 1920 | 3,860 | 39,770 | 3,980 | 650 |
| KAPUSKASING | AT SPRUCE FALLS P & P CO. PLANT AT KAPUSKASING | 1918 | 2,610 | 34,020 | 2,710 | 2 |
| GROUNDHOG | AT BRIDGE ON HWY. 11 IN FAUQUIER | 1920 | 4,610 | 52,500 | 4,960 | 304 |

## IV USES

An important use of the streams in the district is for the development of hydro-electric power. The Hydro-Electric Power Commission of Ontario and private companies operate hydro-electric installations. All the principal power installations within the district are on those streams which drain to Lake Huron. The approximate installed horsepower on these streams is 100,000. There are a number of storage reservoirs and regulating dams on the upper reaches of the main streams, used to increase low summer flows for downstream power development both within and beyond the district. Table 4-4 lists the principal power developments, indicating the stream, the development, the owner and the installed horsepower.

TABLE 4 - 4

PRINCIPAL POWER INSTALLATIONS

| STREAM | DEVELOPMENT | OWNER | INSTALLED HP* |
|---|---|---|---|
| SPANISH | BIG EDDY | INCO | 28,200 |
| | HIGH FALLS | INCO | 21,700 |
| | ESPANOLA | KVPC | 21,600 |
| | NAIRN | INCO | 6,600 |
| VERMILION | WABAGESHIK | INCO | 5,400 |
| WANAPITEI | STINSON | HEPCO | 7,000 |
| | CONISTON | HEPCO | 6,300 |
| | MCVITTIE | HEPCO | 3,600 |

* - FROM THE "PRINCIPAL POWER DEVELOPMENTS IN CANADA" - MARCH 1963.

The power developed by INCO on the Spanish and Vermilion Rivers is used for its own mining and smelting operations at Sudbury. KVPC also uses the power developed on the Spanish River for its operations. The Hydro-Electric Power Commission of Ontario operates the remainder of the installations for distribution of power to municipalities and industries.

The majority of the municipalities in the district rely on surface water sources for water supply. It is estimated that water consumption from these sources is 10 mgd, of which the City of Sudbury uses approximately 7 mgd. Ramsey Lake, located within the city limits in the Junction Creek Watershed, is the city's source of water supply. Other surface sources of municipal water supply, with the user shown in brackets, are: the Wanapitei River(Coniston, Burwash Industrial Farm); the Vermilion River(Copper Cliff); Junction Creek system(Lively); Aux Sables River(Massey); the Spanish River system(Espanola); the Whitson River(Chelmsford); the Chapleau River system(Chapleau); and the Onaping River system (Onaping I.D.).

The International Nickel Company, Falconbridge Mines and the Kalamazoo Vegetable Parchment Company are the major industrial water users within the district. A breakdown of industrial water consumption with regard to source and quantity will be given in detail in Part II of this report.

Many of the lakes and rivers in the district are the receiving bodies for treated and untreated industrial and domestic

wastes. Reference should be made to the specific sections on municipalities and industries for the quantities of waste discharged and the location of the receiving bodies.

The paper and saw mills within the district rely on the rivers and lakes to transport pulp logs and saw logs from the woodland areas to the mills.

The district's many lakes and rivers are suitable for most types of recreational activities, including swimming, boating and fishing. The availability of good recreational facilities together with the somewhat cooler summer temperatures, annually attract large numbers of tourists to the district.

## V CONSERVATION

Two conservation authorities, the Junction Creek Conservation Authority and the Whitson Conservation Authority, function within the District of Sudbury. A third authority, the Mattagami Valley Authority, has jurisdiction over a small area of the Mattagami River Watershed north of the district boundary. The Mattagami Valley Authority does not function within the district and consequently its activities will not be discussed in this report. Authority activities within the district are discussed under separate headings.

### Junction Creek Conservation Authority

The Junction Creek Watershed is approximately 124 square miles. It is bounded on the north by the Whitson River Watershed, on the east by the Wanapitei River Watershed and on the south by the Whitefish River-Panache Lake Watershed. Junction Creek is tributary

to the Vermilion River. The City of Sudbury, one of the member municipalities of the authority, lies almost in the centre of the watershed. Other member municipalities are the towns of Copper Cliff and Lively, and the Townships of Blezard, Graham, Neelon-Garson and Waters.

One of the primary aims of the authority is to provide the urban centres in the watershed with readily accessible recreation facilities. The authority has recommended several sites on the creek for development as recreation areas. A flood control program has been suggested to alleviate flooding in the built-up areas.

Whitson Valley Conservation Authority

The Whitson River Watershed has an approximate area of 123 square miles and is located about three miles north of the City of Sudbury. The watershed is bounded by the Wanapitei River Watershed on the east, the Vermilion River Watershed on the north and west and by the Junction Creek Watershed on the south. The Whitson River is tributary to the Vermilion River. The municipalities within the watershed are the Town of Chelmsford, and parts of the Townships of Balfour, Blezard, Capreol, Falconbridge, Neelon-Garson, Hanmer, Rayside, Creighton and Lumsden.

It has been recommended that the authority undertake the following measures:

(1) Construct a dam and reservoir in Neelon-Garson Township for flood protection - the reservoir would also be used for summer flow augmentation, water supply, fire protection and recreation.

(2) Construct a dyke at Val Caron for flood protection.

(3) Construct a low dam at the outlet of Whitson Lake to provide flood control and water-supply storage.

(4) Construct a low dam at the outlet of Garson Lake to retard spring run-off.

(5) Develop community ponds where feasible.

## VI STREAM WATER QUALITY

### 1. General

Sampling for stream water quality has been confined mainly to the stream or rivers in the southern portion of the District of Sudbury where the greatest concentration of population is located. Accordingly, no samples were collected from those rivers in the James Bay and the Ottawa River drainage area. The sampling was confined to the Lake Huron drainage area and specifically includes Junction Creek and the Spanish, Vermilion, Onaping, Wanapitei and Veuve Rivers.

### 2. Spanish River System - Spanish, Vermilion and Onaping Rivers

On the Spanish River, pollution is particularly evident from the analyses of the samples taken at the Espanola bridge, at sample point S 31.0 (south). The adverse samples at this point may be attributed to waste water discharges from the KVPC plant at Espanola.

Below Chelmsford at sample point SVH 86.3 on the Whitson River, the concentration of coliform organisms exceeded the OWRC objective in two of the three sample runs.

TABLE 4 -5

STREAM SAMPLES SPANISH RIVER SYSTEM - SPANISH, VERMILION AND ONAPING RIVERS

| SAMPLING POINT NO. | DATE SAMPLED | LOCATION | 5-DAY BOD | SOLIDS TOTAL | SOLIDS SUSP. | SOLIDS DISS. | pH AT LAB. | COPPER AS Cu | NICKEL AS Ni | IRON AS Fe | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S 14.4 | Oct. 4/60 | Spanish River at bridge at Massey | 4.0 | 82 | | | | | | | | 5,700 |
| SA 15.6 | Oct. 4/60 | Sauble River at Hwy.#17 | 3.2 | 44 | | | 7.8 | | | 0.4 | 2 | 69 |
| | June 3/63 | | 1.2 | 36 | | | | | | | 1.1 | 45 |
| S 25.8 | Sept.29/60 | Spanish River at Webbwood Bridge | 2.6 | 44 | | | | | | | 2 | 570 |
| | Oct. 4/60 | | 2.4 | 62 | | | 7.7 | | | 0.0 | 4 | 1,600 |
| | June 3/63 | | 1.8 | 110 | | | 7.6 | | | 0.32 | 2.9 | 700 |
| S 31.0 (North) | Sept.29/60 | Spanish River at Espanola Bridge | 1.5 | 30 | | | | | | | 1 | 90 |
| | June 3/63 | | 1.5 | 66 | | | | | | | 2.5 | 5,300 |
| S 31.0 (South) | Sept.29/60 | | 6.4 | 66 | 8 | 56 | | | | | | |
| | June 3/63 | | 5.7 | 136 | | | | | | | 7.0 | 217,000 |
| S 31.3 | Oct. 4/60 | Spanish River at dam at Espanola | 2.1 | 56 | | | 7.6 | | | 0.0 | 4 | 29 |
| S 38.4 | Sept.29/60 | Spanish River at Hwy.#17 bridge | 1.7 | 26 | | | | | | | 1 | 70 |
| | June 3/63 | | 1.0 | 44 | | | 6.8 | | | 0.25 | 1.1 | 24 |
| SV 65.4 | June 21/60 | Vermilion River at confluence with | 0.5 | 72 | 14 | 58 | | | | | | |
| | Sept.29/60 | Junction Creek at McCharles Lake | 1.9 | 54 | | | | | | | 1 | 40 |
| | Aug. 16/61 | | 0.7 | 90 | | | 7.7 | 0.03 | 0.0 | 0.16 | 1.8 | 8 |
| | June 3/63 | | 1.2 | 94 | | | | | | | 2.5 | 670 |
| SVH 86.3 | Oct. 3/60 | Whitson River below Chelmsford at | 2.6 | 186 | | | 7.7 | | | | 3 | 4,700 |
| | Aug. 16/61 | Hwy.#544 | 1.3 | 148 | | | | | | | 1 | 9 |
| | June 3/63 | | 1.2 | 204 | | | | | | | 1.8 | 2,700 |
| SVH 89.3 | Oct. 3/60 | Whitson River above Chelmsford | 1.6 | 164 | | | 7.8 | | | | 3 | 31 |
| | Oct. 20/60 | | | | | | 7.0 | | | 0.7 | 2 | 40 |
| | Aug. 16/61 | | 1.0 | 144 | | | | | | | 2 | 30 |
| | June 3/63 | | 1.6 | 176 | | | | | | | 2.1 | 58 |
| SVH 97.9 | Oct. 3/60 | Whitson River south of Blezard | 1.8 | 148 | | | 7.9 | | | | 3 | 29 |
| | Aug. 16/61 | Valley | 0.9 | 138 | | | | | | | 2 | 0 |
| | June 3/63 | | 1.3 | 162 | | | | | | | 2.6 | 1,200 |
| SVH101.1 | Oct. 3/60 | Whitson River north of Val Caron | 5.2 | 128 | | | 7.5 | | | | 3 | 21 |
| | Aug. 16/60 | | 0.9 | 116 | | | | | | | 2 | 150 |
| | June 3/63 | | 1.3 | 132 | | | | | | | 2.5 | 1,700 |
| SV 97.0 | Oct. 3/60 | Vermilion River at Hwy. bridge 1½ | 1.7 | 102 | | | 7.3 | | | | 2 | 28 |
| | Aug. 16/61 | miles north of Larchwood | 0.9 | 62 | | | | | | | 1 | 8 |
| | June 3/63 | | 1.1 | 72 | | | | | | | 1.1 | 258 |
| SVO 99.9 | Oct. 3/60 | Onaping River at Hwy. west of junction | 1.7 | 116 | | | 7.1 | | | | 2 | 31 |
| | Aug. 16/61 | | 1.0 | 82 | | | | 0.08 | 0.0 | 0.64 | 1 | 16 |
| | June 3/63 | | 1.2 | 76 | | | | | | | 0.8 | 1,100 |

TABLE 4 -5 (CONT'D)

| SAMPLING POINT NO. | DATE SAMPLED | LOCATION | 5-DAY BOD | SOLIDS TOTAL | SOLIDS SUSP. | SOLIDS DISS. | pH AT LAB. | COPPER AS Cu | NICKEL AS Ni | IRON AS Fe | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SVO 106.8 | Nov. 8/62 | ONAPING RIVER 1 MILE UPSTREAM FROM HIGH | 3.6 | 150 | | | | 0.1 | 1.8 | 1.5 | 3.8 | 100 |
| | JUNE 3/63 | FALLS | 1.4 | 84 | | | | | | | 1.0 | 11,400 |
| SVOW107.0 | Nov. 8/62 | WINDY LAKE CREEK JUST ABOVE JUNCTION | 1.4 | 152 | | | | 0.2 | 4.6 | .27 | 1.8 | 60 |
| | JUNE 3/63 | WITH ONAPING | 0.9 | 44 | | | | | | | 0.7 | 148 |
| SVO 109.4 | JUNE27/60 | ONAPING RIVER AT ROAD TO FECUNIS MINE | 0.7 | 54 | 8 | 46 | | | | | | 1,000 |
| | OCT. 18/60 | | 4.8 | 100 | | | | | | | 2 | 570 |
| | AUG. 16/61 | | 1.0 | 84 | | | | 0.2 | 0.0 | 0.68 | 1 | 9 |
| | JUNE 3/63 | | 1.4 | 78 | | | | | | | 1.1 | 5,300 |
| SVOM109.7 | JUNE27/60 | MOOSE CREEK AT RAILWAY JUST ABOVE JUNCTION | 1.6 | 484 | 38 | 446 | | | | | | 1,000 |
| | OCT. 18/60 | | 15. | 816 | | | | | | | 10 | 3,200 |
| | AUG. 16/61 | | 4.0 | 402 | | | | 0.72 | 7.0 | 2.80 | 11 | 0 |
| | NOV. 5/62 | | 8.0 | 932 | | | | | | | 9.5 | 50 |
| | NOV. 8/62 | | 12.0 | 768 | | | 3.5 | | 13.3 | 2.8 | 8 | 270 |
| | JUNE 3/63 | | 4.4 | 992 | | | | | | | 10.5 | 600 |
| SVOMG110.4 | OCT. 18/60 | GRASSY CREEK AT FIRST ROAD ABOVE JUNCTION | 37 | 1102 | | | | | | | 7 | 390 |
| | JUNE 3/63 | | 1.2 | 696 | | | | | | | 21 | 10,700 |
| SVOM 110.9 | MAY 29/59 | MOOSE CREEK AT ROAD BELOW LEVACK MINE | 6.4 | 472 | 40 | 432 | | | | | | 0 |
| | JUNE27/60 | | 4.8 | 468 | 34 | 434 | | | | | | 10 |
| | OCT. 18/60 | | 6.0 | 1130 | | | | | | | 6 | 470,000 |
| | JUNE 3/63 | | 8.8 | 1118 | | | | 2.4 | 2.4 | .05 | 10 | 20 |
| SVOM 111.4 | MAY 29/59 | MOOSE CREEK ABOVE LEVACK MINE OUTLET | 20 | 252 | | | | | | | | 0 |
| | JUNE29/60 | | 1.8 | 200 | | | | | | | | 0 |
| | JUNE 4/63 | | 1.2 | 718 | 28 | 690 | 3.5 | 1.2 | 10.7 | 8.75 | | 20 |
| SVOMG111.3 | OCT. 18/60 | GRASSY CREEK JUST ABOVE LEVACK, OPPOSITE | 40.0 | 1116 | | | | | | | 2 | |
| | JUNE 3/63 | GRAVEL PIT | 1.4 | | | | | 0.11 | TRACE | 9.20 | 48 | 14 |
| SVOMN113.9 | Nov. 14/62 | NORTH BRANCH MOOSE CREEK BELOW STRATHCONA MINE | 1.2 | 322 | | | | | 2.8 | .65 | 1.7 | 50 |
| SVOM 113.0 | Nov. /62 | MOOSE CREEK AT HILLCREST CAMP | 0.8 | 100 | | | | | | .87 | 1.5 | 8 |
| | JUNE 4/63 | (FALCONBRIDGE MINES LTD.) | 0.9 | 100 | 2 | 98 | 4.3 | 0.06 | 0.0 | 0.56 | | 1,800 |
| SVO 109.8 | MAY 29/59 | ONAPING RIVER AT BRIDGE JUST ABOVE MOOSE | 1.1 | 42 | 8 | 34 | | | | | | |
| | OCT. 6/62 | CREEK JUNCTION | 1.1 | 42 | | | | 0.04 | 0.0 | 0.44 | 1 | > 150 |
| | JUNE 3/63 | | 1.1 | 80 | | | | | | | 0.7 | 11,000 |
| SVO 110.2 | MAY 29/59 | ONAPING RIVER ABOVE TOWN STS | 1.2 | 40 | 2 | 38 | | | | | | 10 |
| | JUNE27/60 | | 1.0 | 54 | 10 | 44 | | | | | | |
| | OCT. 18/60 | | 2.2 | 40 | | | | | | | 1 | 63 |
| | AUG. 16/61 | | 1.0 | 48 | | | | 0.0 | 0.0 | 0.4 | 1 | 106 |
| | JUNE 3/63 | | 1.5 | 44 | | | | | | | 0.6 | 124 |
| SV 102.2 | OCT. 3/60 | VERMILION RIVER AT HWY. BRIDGE ABOUT 2 | 1.8 | 84 | | | 7.4 | | | | 2 | 19 |
| | AUG. 16/61 | MILES EAST OF ONAPING RIVER JUNCTION | 0.9 | 52 | | | | | | | 1 | 118 |

TABLE 4-5 (CONT'D)

| SAMPLING POINT NO. | DATE SAMPLED | LOCATION | 5-DAY BOD | SOLIDS TOTAL | SOLIDS SUSP. | SOLIDS DISS. | pH AT LAB. | COPPER AS Cu | NICKEL AS Ni | IRON AS Fe | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SV 127.3 | OCT.20/60 | VERMILION RIVER AT BRIDGE HWY. FROM WHITSON LAKE | | | | | 7.5 | | | 0.12 | 5 | 121 |
| | AUG.16/61 | | 0.7 | 54 | | | | | | | 1 | 224 |
| | JUNE 3/63 | | 1.2 | 58 | | | | | | | 1.1 | 700 |
| SV 134.2 | OCT. 3/60 | VERMILION RIVER BELOW CAPREOL | 2.2 | 76 | | | 7.7 | | | | 2 | 5,700 |
| | AUG.16/61 | | 1.2 | 50 | | | | | | | 1 | 40 |
| | AUG. 8/62 | | 1.8 | 64 | | | | | | | 1.4 | 14,900 |
| | JUNE 5/63 | | 1.0 | 86 | | | | | | | 1.7 | 2,500 |
| SV 137.6 | OCT. 3/60 | VERMILION RIVER AT FOOT OF BASS LAKE WEST AND ABOVE CAPREOL | 2.3 | 56 | | | | | | | | 81 |
| | JUNE 3/63 | | 0.3 | 64 | | | 7.0 | | | 0.44 | 2.1 | 12 |
| SV 145.7 | OCT. 3/60 | VERMILION RIVER AT MILNET ROAD ABOVE ROSS LAKE | 1.7 | 70 | | | 7.5 | | | | 1 | |
| | JUNE 3/63 | | 1.2 | 48 | | | 7.1 | | | 0.35 | 2.6 | 14 |
| SVR 146.8 | JUNE 3/63 | ROBERTS RIVER AT HWY. JUST WEST OF JUNCTION | 0.7 | 38 | | | 6.8 | | | 0.42 | 3.1 | 16 |

NOTE - ALL RESULTS IN PPM UNLESS OTHERWISE INDICATED.

The adverse samples of water from the Onaping River, Grassy Creek,and Moose Creek can be attributed to the discharge of sanitary sewage from Levack and from the mines in the vicinity. The high concentrations of copper, nickel,and iron along with depressed pH's are due to the waste water discharges from the mines and ore processing facilities, in this part of the watershed.

Adverse bacteriological samples were collected from the Vermilion River below Capreol at sample point SV 134.2. This indicates inadequate sewage disposal facilities in the Town of Capreol.

3. Spanish River System - Junction Creek Tributary

The Junction Creek is polluted within the limits of the City of Sudbury by discharges of domestic sewage or defective septic tank systems. High concentrations of copper, nickel and iron and low pH's are found in the water from Copper Cliff Creek and from the Frood Branch of Junction Creek.

When the City of Sudbury sewer system is completed and the pumping stations are in operation, the sewage discharges to the stream will be shifted further downstream to point SVJ 80.3. The stream presently receives most of the sewage at sample point SVJ 82.4. The completion of the sewer system will also result in eliminating the discharge of sewage to Minnow Lake and Ramsey Lake.

The collection of sewage and its discharge further downstream may help to solve local problems but the pollution load to the stream is not reduced.

TABLE 4 - 6

STREAM SAMPLES SPANISH RIVER SYSTEM - JUNCTION CREEK TRIBUTARY

| SAMPLING POINT NO. | | DATE SAMPLED | LOCATION | 5-DAY BOD | SOLIDS TOTAL | SOLIDS Susp. | SOLIDS Diss. | pH AT LAB. | COPPER AS Cu | NICKEL AS Ni | IRON AS Fe | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SVJ | 68.6 | JUNE 21/60 | JUNCTION CREEK AT NARROWS BELOW SIMON LAKE ABOVE McCHARLES LAKE | 1.2 | 362 | 18 | 344 | | | | | | < 10 |
| | | JUNE 27/60 | | 1.3 | 370 | 10 | 360 | | | | | | < 10 |
| | | SEPT.28/60 | | 2.0 | 410 | | | | | | | 1 | 14 |
| | | AUG. 16/61 | | 1.9 | 494 | | | 7.1 | | | | 1 | 1 |
| | | AUG. 1/62 | | 0.7 | | | | | | | | 11.0 | 600 |
| | | JUNE 3/63 | | 1.3 | 524 | | | | | | | 9.0 | 2,700 |
| SVJ | 70.2 | JUNE 21/60 | JUNCTION CREEK AT BRIDGE JUST ABOVE SIMON LAKE | 2.1 | 298 | 14 | 284 | | | | | | |
| | | JUNE 27/60 | | 0.8 | 400 | 12 | 388 | | | | | | < 10 |
| | | SEPT.28/60 | | 2.6 | 530 | 10 | 520 | 7.6 | | | .32 | | 17 |
| | | AUG. 16/61 | | 3.6 | 530 | | | 7.2 | | | | 2.0 | 3 |
| | | AUG. 1/62 | | 2.6 | 638 | | | 8.0 | | | 1.6 | 11.0 | 6,000 |
| | | JUNE 3/63 | | 0.9 | 568 | | | | | | | 10.0 | 228 |
| SVJL | 71.9 | AUG. 16/61 | MEATBIRD CREEK AT HWY. #17 | 4.6 | 502 | | | 6.9 | | | | 2.0 | 10 |
| | | AUG. 1/62 | | 1.2 | 732 | | | 5.7 | | | | 2.9 | 224 |
| | | JUNE 3/63 | | 1.6 | 532 | | | | | | | 5.0 | 160 |
| SVJL | 73.0 | JULY 27/60 | MEATBIRD CREEK AT SIDE ROAD BELOW LIVELY | 6.4 | | | | | | | | 7.0 | 37,000 |
| | | OCT. 5/60 | | 8.0 | 542 | | | | | | | 6.0 | 16,000 |
| | | AUG. 16/61 | | 2.2 | 620 | 44 | 576 | 6.7 | 0.52 | 2.6 | 0.8 | | 30 |
| | | AUG. 1/62 | | 1.5 | 730 | | | 6.4 | | | | 3.3 | 2,100 |
| | | JUNE 3/63 | | 2.6 | 562 | | | 6.6 | 0.75 | 6.5 | 1.32 | 24.0 | 140 |
| SVJL | 75.9 | JULY 27/60 | MEATBIRD CREEK AT HWY. #536 ABOVE LIVELY | 3.6 | | | | | | | | 8.0 | 40 |
| | | OCT. 5/60 | | 1.0 | 780 | | | | | | | 2.0 | 26 |
| | | AUG. 16/61 | | 1.6 | 750 | 54 | 696 | 4.0 | 1.44 | 16.2 | 5.0 | | 0 |
| | | AUG. 1/62 | | 0.8 | 1088 | | | 4.1 | | 46.0 | 1.09 | 12.0 | 28 |
| | | JUNE 3/63 | | 0.7 | 766 | | | 4.2 | 1.4 | 25 | 0.0 | 3.3 | 214 |
| SVJLR | 76.8 | JUNE 27/60 | CREEK FROM CREIGHTON AT HWY. #536 | 1.2 | | | | | | | | 5.0 | 0 |
| | | AUG. 16/61 | | 1.8 | 846 | 34 | 812 | 4.9 | 1.48 | 25.8 | 0.44 | | 0 |
| | | AUG. 1/62 | | 1.2 | 1138 | | | 4.4 | 0.84 | | 0.68 | 6.5 | 1,200 |
| | | JUNE 3/63 | | 1.5 | 832 | | | 4.6 | 2.1 | 28 | 0.0 | 3.6 | 26 |
| SVJ | 73.4 | JUNE 21/60 | JUNCTION CREEK AT ROAD TO MAKADA LAKE | 3.3 | 502 | 12 | 490 | | | | | | < 10 |
| | | JUNE 27/60 | | 1.0 | 488 | 10 | 478 | | | | | | 22,000 |
| | | AUG. 16/61 | | 1.1 | 634 | 24 | 610 | 5.9 | 0.6 | 6.0 | 0.4 | | 0 |
| | | AUG. 1/62 | | 1.3 | 790 | | | 6.9 | 0.16 | | 1.0 | 9.0 | 900 |
| | | JUNE 3/63 | | 3.5 | 812 | | | | | | | 7.5 | 8,000 |
| SVJ | 76.4 | JUNE 21/60 | JUNCTION CREEK AT ROAD $\frac{1}{4}$ MILE WEST OF CONFLUENCE WITH KELLY LAKE | 3.3 | 490 | 20 | 470 | | | | | | < 10 |
| | | JUNE 27/60 | | 1.3 | 470 | 12 | 458 | | | | | 6 | 23,000 |
| | | DEC. 15/60 | | | | | | | | | | | 0 |
| | | AUG. 16/61 | | 1.0 | 650 | 14 | 636 | 5.4 | 0.72 | 4.4 | 0.44 | | 0 |
| | | AUG. 23/61 | | 1.5 | 696 | | | | | | | 3 | |
| | | AUG. 29/61 | | 3.2 | 644 | 18 | 626 | | | | | 3 | |
| | | AUG. 1/62 | | 0.5 | 794 | - | - | 6.8 | - | 3.2 | 0.78 | 9.0 | 3,300 |
| | | APR. 4/61 | | 9.0 | 466 | - | - | | | | | 8 | |
| | | APR. 24/61 | | 4.6 | 458 | - | - | | | | | 8 | |
| | | MAY 3/61 | | 11 | 618 | - | - | 5.8 | .6 | 3.9 | | 3 | |
| | | MAY 3/61 | | 8 | 596 | | | 5.0 | 0.6 | 2.6 | | | |

TABLE 4-6 (CONT'D)

| SAMPLING POINT NO. | DATE SAMPLED | LOCATION | 5-DAY BOD | SOLIDS TOTAL | SOLIDS SUSP. | SOLIDS DISS. | pH AT LAB. | COPPER AS Cu | NICKEL AS Ni | IRON AS Fe | TURBIDITY IN SILICA UNITS | M.F.COLIFORM COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SVJ 76.4 | MAY 18/61 | | 3.6 | 664 | 32 | 632 | 4.2 | 1.2 | 4.8 | | | |
| | JUNE 16/61 | | 2.8 | 748 | 60 | 688 | 5.7 | .9 | 4.2 | | | |
| | JULY 4/61 | | 2.0 | 680 | 18 | 662 | 4.9 | .45 | 3.4 | | | |
| | JULY 18/61 | | 14. | 752 | 62 | 690 | 7.6 | .5 | 5.4 | | | |
| | JULY 31/61 | | 2.8 | 616 | 22 | 594 | 5.4 | .78 | 5.2 | | | |
| | AUG. 4/61 | | 2.0 | 624 | 22 | 602 | 4.9 | .6 | 2.4 | | | |
| | NOV. 20/60 | | 4.4 | | | | | | | | | |
| | MAR. 21/63 | | 4.8 | 1030 | 16 | 1014 | 7.3 | | | 0.16 | | |
| | JUNE 23/63 | | 2.1 | 866 | | | | .57 | 3.2 | 0.7 | 9.5 | 0 |
| | APR. 25/63 | | 4.4 | 736 | 11 | 725 | | | | | | |
| | MAY 29/63 | | 19 | 690 | - | - | | | | | 4.2 | |
| | JUNE 3/63 | | 2.1 | 866 | - | - | 6.7 | 0.57 | 3.2 | 0.72 | 9.5 | 0 |
| SVJR 79.9 | DEC. 16/60 | RAMSEY CREEK AT KELLY LAKE ROAD | 2.5 | 102 | | | | | | | | 0 |
| | JUNE 5/63 | | 2.0 | 154 | | | | | | | 9.0 | 22 |
| SVJ 80.8 | JUNE 21/60 | JUNCTION CREEK JUST BELOW CONFLUENCE | 54. | 594 | 84 | 510 | | | | | | 2,900 |
| | SEPT.28/60 | WITH COPPER CLIFF CREEK | 80. | 1362 | 344 | 1018 | 7.2 | 3.5 | 10.2 | 27.2 | | 80,000 |
| | DEC. 15/60 | | | | | | | | | | | 410 |
| | AUG. 16/61 | | 12. | 1034 | 104 | 930 | 6.4 | 2.25 | 12.2 | 9.0 | | 0 |
| | AUG. 1/62 | | | | | | | | | | | 26,000 |
| | APR. 24/61 | | 7.2 | 484 | - | - | | | | | 10 | |
| | MAY 5/61 | | 65 | 1956 | 1192 | 764 | 6.7 | | | | | |
| | MAY 18/61 | | 21. | 1150 | 488 | 662 | 4.4 | 2.6 | | 6.8 | | |
| | JUNE 16/61 | | 12. | 1106 | 166 | 940 | 6.5 | 7.2 | | | | |
| | JULY 4/61 | | 30 | 996 | 232 | 764 | 4.6 | 2.3 | 5.6 | | | |
| | JULY 18/61 | | 34 | 1230 | 236 | 994 | 6.3 | 1.3 | 12.8 | | | |
| | JULY 31/61 | | 21 | 832 | 112 | 720 | 6.6 | 1.3 | 8.4 | | | |
| | AUG. 4/61 | | 34 | 1124 | 128 | 996 | 6.2 | 1.1 | 5.8 | | | |
| | NOV. 20/60 | | 17 | | | | | | | | | |
| | MAR. 21/63 | | 52 | 876 | 125 | 751 | 8.5 | | | 5.20 | | |
| | APR. 25/63 | | 40 | 798 | 62 | 736 | | | | | | |
| | MAY 29/63 | | 1.9 | 808 | - | - | | | | | 7.5 | |
| | JUNE 3/63 | | 20 | 1092 | - | - | 4.7 | 0.26 | 5.9 | 8.00 | 26.0 | |
| SVJC 81.9 | JUNE 21/60 | COPPER CLIFF BRANCH AT HWY.#17 JUST | 15 | 1308 | 64 | 1244 | | | | | | < 1,000 |
| | JUNE 27/60 | BELOW STP | 6 | 1274 | 36 | 1238 | | | | | 31 | < 100 |
| | SEPT.28/60 | | 12 | 1650 | 292 | 1358 | 3.7 | 2.1 | 4.1 | 26 | | 20 |
| | AUG. 16/61 | | 25 | 1308 | 130 | 1178 | 6.4 | 2.25 | 10.4 | 7.6 | | 0 |
| | AUG. 1/62 | | 12 | 1550 | | | 3.9 | 11.0 | 15.0 | 15.0 | 34 | < 100 |
| | APR. 10/61 | | 34 | 1544 | 244 | 1300 | | | | | | |
| | JUNE 3/63 | | 16 | 1340 | | | 5.6 | 1.9 | 5.7 | 9.2 | 50 | 50 |
| SVJC 82.5 | JUNE 21/60 | COPPER CLIFF BRANCH AT RAILRAOD TO | 5 | 1420 | 44 | 1376 | | | | | | |
| | JUNE 27/60 | COPPER CLIFF ABOVE COPPER CLIFF STP | 13 | 1284 | 50 | 1234 | | | | | 34 | < 100 |
| | AUG. 16/61 | | 12 | 1508 | 120 | 1380 | 3.6 | 0.3 | 4.0 | 5.2 | | 0 |
| | AUG. 1/62 | | 1.4 | 1530 | | | 3.3 | 0.32 | 3.0 | 4.0 | 29 | 0 |
| SVJC 82.8 | SEPT.26/61 | COPPER CLIFF BRANCH AT ROAD TO | 16 | 1886 | 76 | 1810 | 4.0 | 0.6 | TRACE | 64 | | < 10 |
| | JUNE 3/63 | CLARABELLE | 3.8 | 1636 | | | 3.3 | | | 58 | 59.0 | 10 |

TABLE 4 - 6 (CONT'D)

| SAMPLING POINT NO. | DATE SAMPLED | LOCATION | 5-DAY BOD | SOLIDS TOTAL | SOLIDS SUSP. | SOLIDS DISS. | PH AT LAB. | COPPER AS Cu | NICKEL AS Ni | IRON AS Fe | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SVJ 81.1 | JUNE 27/60 | JUNCTION CREEK AT KELLEY LAKE | 4 | 372 | 58 | 314 | | | | | 26 | 17,900 |
| | SEPT.28/60 | ROAD JUST ABOVE BRANCH CONFLUENCE | 74 | 826 | 106 | 720 | 8.8 | | | | | 62,000 |
| | AUG. 16/61 | | 75 | 784 | 84 | 700 | 7.2 | 1.3 | 13.8 | 1.44 | | 1,600 |
| | AUG. 1/62 | | 82 | 888 | | | 7.2 | 0.25 | 9.6 | 1.54 | 38 | 60,000 |
| | APR. 10/61 | | 50 | 486 | 124 | 362 | | | | | | |
| | JUNE 3/63 | | 74 | 1016 | | | 7.0 | 0.35 | 4.7 | 2.0 | | 4,700,000 |
| SVJR 82.8 | SEPT. 1960 | RAMSEY CREEK AT LONG LAKE ROAD | NO FLOW | | | | | | | | | |
| | JUNE 3/63 | | NO FLOW | | | | | | | | | |
| SVJR 84.8 | OCT. 10/60 | MINNOW LAKE CREEK ABOVE CONFLUENCE | 5.0 | 174 | | | | | | | 2.0 | 124,000 |
| | JUNE 6/63 | WITH RAMSEY LAKE | 6.0 | 346 | | | | | | | 6.0 | 4,300 |
| SVJRP85.4 | OCT. 10/60 | OUTLET OF PIKE LAKE TO RAMSEY LAKE | 1.6 | 150 | | | | | | | | 0 |
| | JUNE 6/63 | | 0.8 | 166 | | | | | | | | 1,500 |
| SVJRM87.0 | OCT. 10/60 | OUTLET OF MUD LAKE TO RAMSEY LAKE | 1.4 | 54 | | | | | | | 2.0 | 32 |
| | JUNE 5/63 | AT SOUTH BAY ROAD | 2.0 | 54 | | | 5.5 | | | 1.56 | 2.9 | 36 |
| SVJRT83.7 | JUNE 5/63 | OUTLET OF TROUT LAKE AT LONG LAKE ROAD | 0.9 | 112 | | | | | | | 1.1 | 17 |
| SVJ 82.4 | JUNE 22/60 | JUNCTION CREEK AT MARTINDALE ROAD | 30 | 550 | 50 | 500 | | | | | | 50,000 |
| | JUNE 27/60 | BELOW SUDBURY | 7 | 382 | 66 | 316 | | | | | 30 | 520,000 |
| | SEPT.28/60 | | 100 | 722 | 94 | 628 | 7.0 | | | | | 1,120,000 |
| | AUG. 16/61 | | 125 | 758 | 138 | 620 | 6.1 | 1.04 | 1.38 | 1.44 | | 6,000 |
| | AUG. 1/62 | | 134 | 874 | 150 | 724 | 6.7 | 0.35 | 6.8 | | | 60,000,000 |
| | JUNE 3/63 | | 88 | 722 | | | 6.6 | 0.37 | 4.9 | 1.90 | 35 | 17,900,000 |
| SVJ 83.0 | JUNE 22/60 | JUNCTION CREEK AT HWY.#69 | 1.6 | 560 | 26 | 534 | | | | | | 90 |
| | SEPT.28/60 | | 1.2 | 810 | | | 5.4 | | | | 10 | 200 |
| | AUG. 16/61 | | 1.6 | 1588 | 38 | 1550 | 6.2 | 1.4 | 13.6 | 1.32 | | 0 |
| | AUG. 1/62 | | 8.4 | 1276 | 14 | 1262 | 6.7 | 0.35 | 6.8 | | | 41,000 |
| | JUNE 27/60 | | 0.9 | 322 | 26 | 296 | | | | | 25 | 10 |
| | JUNE 3/63 | | 10.0 | 756 | | | 6.5 | 0.87 | 6.5 | 0.9 | 12 | 510 |
| SVJ 84.2 | JUNE 3/63 | JUNCTION CREEK AT CEDAR ST. BELOW NOLIN CREEK OUTLET | 2.0 | 748 | | | 6.7 | 0.82 | 8.1 | 0.78 | 12.5 | 15,000 |
| SVJN 87.7 | OCT. 26/61 | NOLIN CREEK AT ROAD BELOW MURRAY MINE | 1.8 | 838 | 34 | 804 | | | | | | |
| SVJF 86.7 | SEPT.28/60 | FROOD BRANCH AT ROAD TO SUDBURY | 5.0 | 2024 | 64 | 1960 | 3.5 | | | | | <10 |
| | AUG. 16/61 | JUNCTION ONE MILE NORTH OF | 0.7 | 1576 | 50 | 1526 | 3.5 | 3.5 | 3.94 | 6.0 | | 0 |
| | AUG. 1/62 | CONFLUENCE | 0.6 | 2090 | 3 | 2087 | 3.5 | 0.44 | 46.0 | 0.25 | | 6 |
| | JUNE 3/63 | | 4.0 | 1512 | | | 3.8 | 1.7 | 21.5 | 0.1 | 13.5 | 38 |
| SVJ 89.3 | SEPT.28/60 | JUNCTION CREEK AT ROAD DUE WEST OF | 1.0 | 290 | | | 6.6 | | | | 2 | 4,900 |
| | AUG. 16/61 | SUDBURY JUNCTION | 1.2 | 312 | 32 | 280 | 7.7 | 0.08 | 0.0 | 0.72 | | 130 |
| | AUG. 1/62 | | 0.8 | 632 | 2 | 630 | 7.8 | 0.07 | 6.2 | | | 900 |
| | JUNE 3/63 | | 2.4 | 338 | | | 7.2 | 0.15 | TRACE | 0.60 | 6.5 | 620 |
| SVJ 90.8 | SEPT.28/60 | JUNCTION CREEK AT SAND PIT ROAD | 1.3 | 120 | | | 7.7 | | | | 2 | |
| | JUNE 3/63 | NEAR POWER SUB-STATION | 0.7 | 622 | | | 7.7 | 0.17 | 5.0 | 0.0 | 1.7 | 38 |

NOTE - ALL RESULTS IN PPM UNLESS OTHERWISE INDICATED.

The quality of the water in Junction Creek is considerably improved during its passage through Kelley Lake. This is apparent from a comparison of the sample results from points SVJ 76.4 and SVJ 81.1. The quality of stream water improves progressively downstream from the zone of degradation caused by sewage discharges. However, this phenomenon does not justify the pollution of waterways.

In July of 1960, a biological and chemical survey of the Kelley Lake Watershed was undertaken. In summary, it was found that the lake could be divided into three zones with respect to visual, chemical and biological observations and characteristics.

In the vicinity of the mouth of Junction Creek, the lake was turbid, septic, acidic and was devoid of animal life.

In the vicinity of Ramsey Creek, the outlet from Robinson Lake, the lake contained clear unpolluted water from Ramsey Lake. The lack of pollution was indicated by an abundant oxygen concentration, a normal pH, and evidence of considerable biological activity typical of unpolluted lakes in the district.

Ninety per cent of the remaining lake surface was bright green in colour, indicative of organically enriched water supporting abundant algae growth. Below a depth of approximately three feet, no animal life was observed. High concentrations of copper and nickel were present.

Relatively high concentrations of copper, nickel, and iron were detected in the water from Coniston Creek. Industrial cooling water is also discharged to the creek from the Coniston smelter.

4. French River System - Veuve River Tributary

The samples collected from the Veuve River have all been satisfactory and conform to the OWRC objectives for the sanitary chemical and the bacteriological quality of stream water. It is possible that these satisfactory results were obtained even though small volumes of domestic sewage were gaining access to the river from the communities enroute. At Warren and Hagar, measures are being adopted to ensure the satisfactory operation of private sewage disposal facilities.

5. French River System - Wanapitei River Tributary

Treated sewage is discharged to the Wanapitei River from the Town of Coniston, Burwash Industrial Farm, and from Falconbridge Township, but no adverse effect on the Wanapitei River is experienced from these discharges. The Falconbridge sewage treatment plant discharges effluent to Emery Creek which normally receives the overflow from Boucher Lake. Accordingly, the flow in Emery Creek at Lake Boucher contains only the treatment plant effluent.

The discharge of polluting waste to the roadside ditches was noted at the community of Wanapitei but the quality of the river remains satisfactory. The tremendous dilution provided by the Wanapitei River prevents the development of objectionable conditions but to protect the health of the local residents, no untreated sewage should be discharged to the river.

6. The high concentration of metal ions noted in water samples taken in the vicinity of Sudbury will prevent fish and most other life from living in these waters. Concentrations of copper in soft waters

TABLE 4 - 7

STREAM SAMPLES FRENCH RIVER SYSTEM - VEUVE RIVER TRIBUTARY

| SAMPLING POINT NO. | DATE SAMPLED | LOCATION | 5-DAY BOD | SOLIDS TOTAL | SOLIDS SUSP. | SOLIDS DISS. | PH AT LAB. | COPPER AS Cu | NICKEL AS Ni | IRON AS Fe | TURBIDITY IN SILICA UNITS | M.F. COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FV 94.6 | SEPT. 27/60 | VEUVE RIVER AT BRIDGE JUST SOUTH OF WARREN | 3.2 | 130 | | | 7.2 | | | | 3 | 200 |
| | JUNE 3/63 | | 1.0 | 86 | | | | | | | 6.5 | 110 |
| FVW 95.1 | SEPT. 27/60 | WARREN CREEK AT HIGHWAY JUST NORTH OF JUNCTION | 1.2 | 192 | | | 7.4 | | | | 2 | 740 |
| | JUNE 3/63 | | 1.2 | 134 | | | | | | | 7.0 | 350 |
| FV 102.0 | SEPT. 27/60 | VEUVE RIVER AT HAGAR | 1.7 | 84 | | | 7.2 | | | | 4 | 200 |
| | JUNE 3/63 | | 1.2 | 92 | | | | | | | 8.0 | 570 |
| FV 108.7 | SEPT. 27/60 | VEUVE RIVER AT BRIDGE SOUTH OF MARKSTAY | 1.8 | 106 | | | 7.3 | | | | 4 | 150 |
| | JUNE 3/63 | | 2.0 | 84 | | | | | | | 6.0 | 150 |
| FVN 109.4 | SEPT. 27/60 | NORTH VEUVE RIVER AT SIDE ROAD NORTH OF MARKSTAY | 3.2 | 94 | | | 7.2 | | | | 5 | 20 |
| | JUNE 3/63 | | 1.1 | 96 | | | | | | | 5.5 | 40 |
| FV 109.5 | SEPT. 27/60 | VEUVE RIVER AT HIGHWAY BRIDGE SOUTH-WEST OF MARKSTAY | 2.0 | 82 | | | 7.1 | | | | 4 | 290 |
| | JUNE 3/63 | | 0.7 | 84 | | | | | | | 4 | 52 |

NOTE - ALL RESULTS IN PPM UNLESS OTHERWISE INDICATED.

TABLE 4 - 8

STREAM SAMPLES FRENCH RIVER SYSTEM - WANAPITEI RIVER TRIBUTARY

| SAMPLING POINT NO. | | DATE SAMPLED | LOCATION | 5-DAY BOD | SOLIDS TOTAL | SOLIDS SUSP. | SOLIDS DISS. | pH AT LAB. | COPPER AS Cu | NICKEL AS Ni | IRON AS Fe | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | 19.0 | OCT. 3/60 | FRENCH RIVER AT HIGHWAY #69 | 1.9 | 64 | | | 6.7 | | | | | 72 |
| | | JUNE 2/63 | | 1.1 | 52 | | | | | | | 1.8 | 44 |
| FW | 30.1 | DEC. 16/60 | WANAPITEI RIVER AT ROAD 3 MILES SOUTH-WEST OF BURWASH | 1.9 | 44 | | | | | | | | 5 |
| | | JUNE 4/63 | | 1.0 | 131 | | | | | | | 5.0 | 420 |
| FWT | 39.4 | JUNE 4/63 | ESTAIRE CREEK AT HIGHWAY #69 | 1.5 | 152 | | | | | | | 3.1 | 180 |
| FW | 42.4 | JUNE 4/63 | WANAPITEI RIVER AT HIGHWAY #69, 3 MILES BELOW ST. CLOUD | 0.9 | 130 | | | | | | | 4.0 | 18 |
| FW | 45.2 | JUNE 4/63 | WANAPITEI RIVER AT BRIDGE, ST. CLOUD | 1.0 | 140 | | | | | | | 6.5 | 20 |
| FWC | 52.8 | OCT. 20/60 | CONISTON CREEK AT ROAD JUST ABOVE JUNCTION | 4.8 | 170 | | | 7.0 | | | | | 10 |
| | | JUNE 4/63 | | 1.0 | 236 | | | | 0.33 | 2.6 | 1.3 | 7.5 | 20 |
| FWCB | 54.9 | OCT. 20/60 | ROMFORD CREEK AT AUSTIN - CONISTON ROAD | 2.3 | 148 | | | 7.1 | | | | | 33 |
| | | JUNE 4/63 | | 0.5 | 408 | | | | | | | 1.8 | 17 |
| FWC | 54.6 | OCT. 20/60 | CONISTON CREEK AT ROAD EAST OF CONISTON | 2.6 | 128 | | | | | | | | 10 |
| | | JUNE 4/63 | | 0.6 | 236 | | | | | | | 1.8 | 27 |
| FW | 53.0 | OCT. 20/60 | WANAPITEI RIVER AT POWER DAM | 1.5 | 48 | | | | | | | | 65 |
| | | JUNE 4/63 | | 0.8 | 120 | | | | | | | 2.5 | 30 |
| FW | 55.2 | OCT. 5/60 | WANAPITEI RIVER AT HIGHWAY #17, AT WANAPITEI | 2.8 | 64 | | | 7.7 | | | | | 17 |
| | | JUNE 4/63 | | 0.8 | 174 | | | | | | | 2.8 | 38 |
| FWYR | 67.1 | SEPT.29/60 | EMERY CREEK JUST BELOW OUTFALL FROM FALCONBRIDGE TWP. S.T.P. | | 878 | | | | | | | | 1,200,000 |
| | | DEC. 16/60 | | 3.4 | 774 | | | | | | | | |
| FWYR | 67.4 | SEPT.29/60 | BOUCHER CREEK AT OUTLET BOUCHER LAKE EAST OF FALCONBRIDGE | | 750 | | | | | | | | 70 |
| FW | 59.7 | OCT. 5/60 | WANAPITEI RIVER AT DAM, TIMMINS CHUTE | 2.3 | 52 | | | 7.8 | | | | | 3 |
| | | JUNE 4/63 | | 0.5 | 80 | | | | | | | 1.3 | 4 |

NOTE - ALL RESULTS IN PPM UNLESS OTHERWISE INDICATED.

typical of the watersheds might be expected to be toxic to fish and algae, and perhaps other life, at about 0.02 ppm. All samples examined for copper exceeded this limit. Nickel has been reported as acutely toxic to fish at 10 ppm. This level was also exceeded in a number of samples reported. The toxic effects of heavy metals when they occur in combination is generally additive.

Dudoroff and Katz 1953 (5) have reviewed toxicity of metals to fish in some detail and should be referred to for detailed information on this complex subject.

## REFERENCES

1. St.Lawrence and Southern Hudson Bay Drainage Water Resources Paper No.129 - by Department of Northern Affairs and Natural Resources.

2. Principal Power Developments in Canada(1963) - by the Department of Northern Affairs and National Resources.

3. Junction Creek Conservation Report(1959) Land and Forest and Recreation - by the Ontario Department of Planning and Development.

4. Whitson Valley Conservation Report(1962)Water - by the Ontario Department of Planning and Development.

5. Journal Sewage and Industrial Wastes, Volume 25, July 1953 - by Dudoroff and Katz. Critical Review of Literature on the Toxicity of Industrial Wastes and Their Components to Fish, II The Metals, as Salts.

# CHAPTER FIVE

## CITY OF SUDBURY

PAGE No.

# CHAPTER 5 - CITY OF SUDBURY

## I GENERAL

The City of Sudbury and surrounding municipalities represent the greatest concentrations of population in north-eastern Ontario. The population of Sudbury is 80,523.

The economy of the district revolves about the smelting and refining of copper and nickel ores in the Sudbury Basin. The major companies in this industry are International Nickel Company of Canada Limited and Falconbridge Nickel Mines Limited.

The Sudbury Townsite was surveyed in 1887 by the Canadian Pacific Railway Company and in 1892, the Town of Sudbury was incorporated. In 1930 the town became the City of Sudbury and in 1960 Sudbury amalgamated with McKim Township and annexed Frood Mine Townsite and the western half of Neelon Township to form the new enlarged City of Sudbury.

## II WATER SUPPLIES

### 1. Sources

Lake Ramsey is the principle source of water for the major portion of the city. Two deep wells supply the recently annexed section of the city which formerly comprised part of the Township of Neelon. The surface and the ground-water supplies are interconnected.

The Sudbury and Algoma Sanatorium also uses Lake Ramsey as a source of water supply.

The INCO installations at Murray Mine, Copper Cliff North Mine and Frood-Stobie Mines including the Frood Mine Townsite are supplied with water from Pump Lake, Lady Macdonald Lake and Whitson Lake respectively.

2. Treatment Works and Water Quality

The municipal wells are used without treatment. The municipal Ramsey Lake supply is chlorinated and fluoridation is effected. The bacterial quality of the treated water has been satisfactory. Although, in general, the fluoride applications have been adequate on a few occasions the dosage has not provided the necessary concentration of 1.0 ppm. The combined capacity of the two wells is estimated at 725 gpm and the effective pumping capacity at the St.David pumping station(Ramsey Lake supply) is estimated at 6,500.gpm. During 1962 the average and maximum consumptions were 5.0 mgd and 7.75 mgd respectively. Generally, the water consumption approximates 62 gallons per capita per day. It is noted that the water consumption in Sudbury is generally lower than that experienced in many other municipalities of comparable size.

The Sudbury and Algoma Sanatorium, Ramsey Lake supply is chlorinated. The bacterial quality of the treated water has been satisfactory and the average water consumption is approximately 45,000 gpd.

Chlorination is the only treatment applied to the Pump Lake, the Lady Macdonald Lake and the Whitson Lake supplies.

The chemical analyses of raw water samples of the water supplies above are summarized in Table 5-1.

TABLE 5 - 1

CITY OF SUDBURY - CHEMICAL ANALYSES OF WATER SUPPLIES

| LOCATION | DATE SAMPLED | HARDNESS AS CaCO3 (PPM) | ALKALINITY AS CaCO3 (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | pH AT LAB. | FLUORIDE AS F (PPM) | COLOUR IN HAZEN UNITS | TURBIDITY IN SILICA UNITS |
|---|---|---|---|---|---|---|---|---|---|
| RAMSEY LAKE | MAY 1/63 | 64 | 20 | 0.42 | 21 | 7.9 | 0.2 | 15 | 6.5 |
| SECOND AVE. WELL | MAY 30/62 | 90 | 56 | 1.1 | 14 | 7.4 | 0.3 | - | - |
| MALLEY DR. WELL | MAY 30/62 | 98 | 84 | 0.27 | 12 | 8.2 | 0.1 | - | - |
| PUMP LAKE | MAR. 20/63 | 52 | TRACE | 0.67 | TRACE | 6.5 | 0.1 | 5 | 0.8 |
| LADY MACDONALD LAKE | APR. 30/63 | 60 | 10 | 0.60 | 4 | 7.0 | 0.2 | - | 4.0 |
| WHITSON LAKE | APR. 2/63 | 50 | TRACE | 0.66 | 4 | 4.9 | 0.1 | 5 | 1.8 |

The chemical quality of the municipal supplies(Ramsey Lake, Second Ave. well and the Malley Dr. well), is generally satisfactory with the exception of the iron content. Excessive concentrations of iron have occurred in the distribution system. The water tends to be corrosive. Taste and odour problems have been experienced with the Lake Ramsey supply in the fall and spring of the year. The most probable cause of these conditions is attributed to micro-organisms, primarily algae, which may cause aromatic, geranium or fishy tastes in the water. Correction of these difficulties would require alterations to the existing treatment process. In this regard breakpoint chlorination, superchlorination with de-chlorination, and chlorine

dioxide treatment have been found to be effective.

The chemical quality of the Pump Lake, the Lady Macdonald Lake, and the Whitson Lake supplies is similar. These waters are soft, exhibit iron concentrations in excess of the recommended limit of 0.3 ppm. and have corrosive characteristics.

3. Distribution

The portions of the city that are serviced with municipal water are shown on Figure 5-1. Basically, there are two separate distribution systems serving the enlarged City of Sudbury. The older, major distribution system which is supplied from Lake Ramsey includes two elevated tanks providing a total of 1.5 million gallons storage. The distribution system acquired from the Township of Neelon and supplied by the Second Ave. well and the Malley Dr. well is provided with a 1.5 million gallon standpipe. The two systems are interconnected.

A storage tank with a capacity of 208,000 gallons is provided in the Frood Mine Townsite. The townsite at Murray Mine is provided with a 160,000-gallon capacity storage tank. There are no connections to the municipal water distribution system.

4. Water Requirements for the Future

The Ramsey Lake supply is adequate to satisfy the present demands of the city.

The City Engineer estimates that by 1980 the approximate population of the city will be 104,000 persons. Considering a

water consumption of 80 gallons per capita per day, the average daily demand will be 8.3 million gallons. In 1958, Proctor & Redfern recommended that, due to the terminal capacity of Lake Ramsey, the lake be used only to supply the older section of the city and the Township of McKim area. The Township of Neelon area would rely on ground water. If Ramsey Lake would be the only source of water used for the enlarged city, then some time in the future, possibly before the year 1980, the City of Sudbury may be compelled to seek supplies from additional sources in order to meet the demands.

5. Potential Additional Water Supplies

Trout Lake located south of Ramsey Lake could be utilized as a surface water source to augment the present supply from Ramsey Lake. The construction of a conservation dam at the outlet from Trout Lake would be necessary.

In order to establish more accurately the capacity of Ramsey Lake as a water supply source, gauging of inflow and outflow to the lake should be carried out.

A preliminary estimate of the ground-water capacity of the Sudbury-Neelon & Garson well field given by International Water Supply Limited is between 5 and 10 million gallons per day. As the water has good chemical and bacteriological quality the well field is the best source for increased ground-water supplies.

## III WATER POLLUTION

1. Sanitary Waste Disposal

(a) Existing Conditions

The areas served with sanitary sewers are shown on Figure 5-1.

A separate system of sewers is provided in the older portion of the city. Presently, thirty-two sewage lift stations are provided to overcome topographical limitations. Sanitary sewage is conveyed to a screening plant which removes the coarse, objectionable and floating matter from the raw sewage. The organic strength of the waste discharged to Junction Creek, when the plant is operating from May 1st to September 30th, is only slightly less than that of untreated sewage. Several years ago a large scale sewerage program was initiated. To date, in addition to an extensive sanitary sewer construction program, six shafts have been sunk and a tunnel excavated in rock. This tunnel extends for about five miles from a point in the vicinity of New Sudbury southerly to a terminal near Kelley Lake in the vicinity of Kelley Lake Road. The tunnel and the associated main sewage lift station are scheduled for completion by July 1963. The completion of the connecting earth tunnel which will allow the inclusion of the sewage from the North Sudbury and Minnow Lake area into the rock tunnel is not expected until October 1963. The remainder of the new enlarged city is served by private sewage disposal systems which include septic tanks and privies. Night soil collection is provided for the latter. Relief from the insanitary disposal of domestic sewage in the remaining problem areas awaits the construction of sewerage works.

The Sudbury and Algoma Sanatorium is served by a 30,000 gpd capacity activated sludge sewage treatment plant. The plant effluent is chlorinated and discharged to Pike Lake.

Sanitary wastes from the townsite at Murray Mine are conveyed to a septic tank with a rated capacity of 125 persons. This tank discharges into the septic tank serving the mine. This latter unit was designed to receive sanitary wastes from 1,600 persons. The effluent is discharged to a swamp which is tributary to Nolin Creek a tributary of Junction Creek.

Sanitary wastes originating from the Copper Cliff North Mine and Clarabelle open pit operations are pumped to the Copper Cliff sewage treatment plant.

Stobie Mine is served by a septic tank with a design capacity of 1,500 persons. The effluent flows into the upper reaches of Junction Creek.

Sanitary sewage from Frood Mine and Frood Mine Townsite is discharged to a septic tank designed for 1,300 persons. The effluent is discharged to the Frood branch of Junction Creek.

(b) Proposed Sewage Works

When the rock tunnel is put into operation the municipal screening plant will be abandoned. A sewage treatment plant should be constructed in the vicinity of shaft #1 to treat the sewage prior to its discharge to Junction Creek.

Proposals were advanced in 1955 to improve the sewage works for Murray Mine. At that time an activated sludge sewage treatment plant was considered. This project should be renewed with the view

toward alleviating the pollution load on Junction Creek.

In 1955 consideration was given to providing secondary sewage treatment at both the Frood and Stobie Mine sites. Further studies were conducted in 1961 on providing improved sewage treatment facilities at Frood Mine and Frood Mine Townsite. This course should be actively pursued.

2. Industrial Waste Disposal

Most of the industries located in the City of Sudbury, are service industries, only a few of which discharge significant quantities of industrial wastes. Process industries with industrial wastes include four dairies and a plating shop which will not be discussed at this time. A brewery, and four mines owned and operated by International Nickel Company of Canada Limited will be discussed.

The brewery, Doran's Northern Ontario Breweries Limited produces 9,000 gallons per day of ale and lager. Approximately 35 to 40 employees work within the plant on a five days per week schedule. The water necessary for operations is supplied by the municipality at a rate of approximately 30,000 gpd. The domestic and industrial wastes are discharged to municipal sewers and thence to Junction Creek without pre-treatment. The mash from the operations is trucked away in a wet state to be used as animal feed. It has been estimated that approximately 200 pounds of hops(dry basis) per brewing day are sewered.

It is envisaged that at such time as municipal sewage treatment is provided the wastes from the brewery be included. However, to

facilitate ease of sewage plant operation, it may be necessary to dispose of hops and yeast in a different manner.

Four mines are located within the boundaries of the City of Sudbury; the Frood and Stobie Mines, the Murray Mine, and the Copper Cliff North Mine. The Frood-Stobie Mines were formerly both open pit and underground operations. However, the open pit operations have recently closed. Approximately 3,200 persons are employed at the mines. Approximately 1,700 U.S. gpm of mine water is pumped from the two mines to a tributary of Junction Creek. The Murray Mine operations include mining and crushing. The mine water flow is approximately 340 U.S. gpm and is pumped to a swampy area which feeds Nolin Creek, a tributary of Junction Creek. The Copper Cliff North Mine is presently under development. The mine water is discharged to Copper Cliff Creek. Productive operations presently entail open-pit mining of the Clarabelle open pit located in the unorganized Township of Snider.

For more detailed information and recommendations regarding waste disposal practices of INCO industrial operations, reference should be made to Part II of this report which will be published at a later date.

3. Surface Water Quality

The sanitary chemical and bacteriological analyses of the samples collected from watercourses and outfalls discharging to the watercourses located in the City of Sudbury are summarized in Table 5-2.

## TABLE 5 - 2

### VICINITY OF SUDBURY - STREAM & OUTFALL SAMPLES

| SAMPLING POINT NO. | | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | PHENOLS (PPB) | pH AT LAB. | NICKEL AS Ni (PPM) | IRON AS Fe (PPM) | COPPER AS Cu (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SVJ | 90.8 | JUNCTION CR. AT SAND PIT ROAD NEAR POWER SUB-STATION | SEPT. 28/60 | 1.3 | 120 | | | | 7.7 | | | | 2 | |
| | | | JUNE 3/63 | 0.7 | 622 | | | | 7.7 | 5.0 | 0.0 | 0.17 | 1.7 | 38 |
| SVJ | 89.3 | JUNCTION CR. AT ROAD DUE WEST OF SUDBURY JUNCTION | SEPT. 28/60 | 1.0 | 290 | | | | 6.6 | | | | 2 | 4,900 |
| | | | AUG. 16/61 | 1.2 | 312 | | | | 7.7 | 0.0 | 0.72 | 0.08 | | 130 |
| | | | AUG. 1/62 | 0.8 | 632 | | | | 7.8 | 6.2 | | 0.07 | | 900 |
| | | | JUNE 3/63 | 2.4 | 338 | | | | 7.2 | TRACE | 0.60 | 0.15 | | 620 |
| SVJF | 89.4-1 | FROOD MINE - MINE WATER EFFLUENT | DEC. 14/60 | 5.0 | 3550 | | | | 4.6 | 126 | 94 | 18.7 | | |
| | | | JUNE 11/63 | | 2992 | 114 | 2878 | ACIDITY-172 | 4.7 | 56 | 60.0 | 1.7 | 53.0 | |
| SVJF(N) | 88.3S | STOBIE MINE - SEPTIC TANK EFFLUENT | OCT. 27/60 | 285.0 | 480 | | | | 7.4 | | 2.4 | | | |
| | | | DEC. 14/60 | 44.0 | 150 | | | | 6.8 | | 4.8 | .2 | | 110,000 |
| | | | JUNE 11/63 | | 138 | 19 | 119 | ACIDITY-16 | 4.7 | TRACE | 2.9 | 0.43 | 16.0 | |
| SVJF(N) | 88.3-1 | STOBIE MINE - MINE WATER EFFLUENT | DEC. 14/60 | 17.0 | 3220 | | | | 4.5 | 177 | 440 | 8.0 | | |
| SVJF | 86.7 | FROOD BRANCH AT ROAD TO SUDBURY | SEPT. 28/60 | 5.0 | 2024 | | | | 3.5 | | | | | < 10 |
| | | | AUG. 16/61 | 0.7 | 1576 | | | | 3.5 | 3.94 | 6.0 | 3.5 | | 0 |
| | | | AUG. 1/62 | 0.6 | 2090 | | | | 3.5 | 46.0 | 0.25 | 0.44 | | 6 |
| | | | JUNE 3/63 | 4.0 | 1512 | | | | 3.8 | 21.5 | 0.1 | 1.7 | 13.5 | 38 |
| SVJN | 88.0S | MURRAY MINE SEPTIC TANK EFFLUENT | OCT. 26/61 | 22.0 | 126 | | | | | | | | | 2,170 |
| SVJN | 88.0-1 | MURRAY MINE - MINE WATER | JUNE 11/63 | | 1754 | 56 | 1698 | ACIDITY-180 | 4.2 | 52.0 | 39.0 | 0.74 | 65.0 | |
| SVJN | 87.7 | NOLINS CR. AT ROAD BELOW MURRAY MINE | OCT. 26/61 | 1.8 | 838 | | | | | | | | | |
| SVJRP | 85.4 | PIKE LAKE CR. BETWEEN PIKE AND RAMSEY LAKES | OCT. 17/60 | 1.60 | 150 | | | | | | | | | 0 |
| | | | JUNE 6/63 | 0.8 | 160 | | | | | | | | 2.1 | 1,500 |
| SVJR | 84.8 | MINNOW LAKE CR.- TO RAMSEY LAKE | OCT. 19/60 | 5. | 174 | | | | | | | | 2. | 124,000 |
| | | | JUNE 6/63 | 6.0 | 346 | | | | | | | | 6.0 | 4,300 |
| SVJRM | 87.0 | OUTLET OF MUD LAKE | OCT. 19/60 | 1.4 | 54 | | | | | | | | 2 | 32 |
| | | | JUNE 5/63 | 2.0 | 54 | | | | | | | | 2.9 | 36 |
| SVJR | 86.7 | SANITORIUM EFFLUENT TO PIKE LAKE | OCT. 17/60 | 195. | 652 | 78 | 574 | | | | | | | 0 |
| | | | DEC. 13/60 | 120. | 484 | 78 | 406 | | | | | | | 0 |
| | | | JUNE 3/63 | 110 | 526 | 111 | 415 | | | | | | | 115,000,000 |
| SVJRT | 83.7 | OUTLET OF TROUT LAKE | JUNE 5/63 | 0.9 | 112 | | | | | | | | 1.1 | 17 |

TABLE 5 - 2 CONT'D.

VICINITY OF SUDBURY - STREAM & OUTFALL SAMPLES

| SAMPLING POINT NO. | | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | PHENOLS (PPB) | PH AT LAB. | NICKEL AS Ni (PPM) | IRON AS Fe (PPM) | COPPER AS Cu (PPM) | TURBIDITY IN SILICA UNITS | M.F. COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SVJ | 84.2 | JUNCTION CREEK AT CEDAR STREET | JUNE 3/63 | 2.0 | 748 | | | | 6.7 | 8.1 | .78 | .82 | 12.5 | |
| SVJ | 83.0 | JUNCTION CR. AT HWY. #69 | JUNE 22/60 | 1.6 | 560 | 26 | 534 | | | | | | | 90 |
| | | | SEPT.28/60 | 1.2 | 810 | | | | 5.4 | | | | 10 | 200 |
| | | | AUG. 16/61 | 1.6 | 1588 | 38 | 1550 | 8 | 6.2 | 13.6 | 1.32 | 1.4 | | 0 |
| | | | AUG. 1/62 | 8.4 | 1276 | 14 | 1262 | | 6.7 | 6.8 | | 0.35 | | 41,000 |
| | | | JUNE 27/60 | 0.9 | 322 | 26 | 296 | | | | | | 25 | 10 |
| | | | JUNE 3/63 | 10.0 | 756 | | | | 6.5 | 6.5 | .9 | .87 | 12 | 510 |
| SVJ | 82.4 | MARTINDALE RD. BELOW SUDBURY S.T.P. | JUNE 22/60 | 30 | 550 | 50 | 500 | | | | | | | 50,000 |
| | | | JUNE 27/60 | 7 | 382 | 66 | 316 | 0 | | | | | 30 | 520,000 |
| | | | SEPT.28/60 | 100 | 722 | 94 | 628 | | 7.0 | | | | | 1,120,000 |
| | | | AUG. 16/61 | 125 | 758 | 138 | 620 | | 6.1 | 13.8 | 1.44 | 1.04 | | 6,000 |
| | | | AUG. 1/62 | 134 | 874 | 150 | 724 | | 6.7 | 6.8 | | 0.35 | | 60,000,000 |
| | | | JUNE 3/63 | 88 | 722 | | | | 6.6 | 4.9 | 1.9 | .37 | 35 | 17,900,000 |
| SVJ | 81.1 | JUNCTION CR. AT KELLEY LAKE RD. | JUNE 21/60 | 54 | 594 | 84 | 510 | | | | | | | 2,900 |
| | | | SEPT.28/60 | 74 | 826 | 106 | 720 | 20 | 8.8 | | | | | 7 |
| | | | AUG. 16/61 | 75 | 784 | 84 | 700 | 6 | 7.2 | 13.8 | | | | 1,600 |
| | | | AUG. 1/62 | 82 | 888 | | | 40 | 7.2 | 9.6 | 1.5 | .25 | 38 | 60,000 |
| | | | JUNE 3/63 | 74 | 1016 | | | | 7.0 | 4.7 | 2.0 | .35 | 26 | 4,700,000 |
| SVJ | 80.3S | LOCKERBY SEWER | DEC. 16/60 | 100 | 484 | 78 | 406 | | | | | | | 400,000 |
| SVJR | 79.9 | RAMSEY CR., OUTLET OF ROBINSON LAKE AT KELLEY LAKE RD. | DEC. 16/60 | 2.5 | 102 | | | | | | | | | 0 |
| | | | JUNE 6/63 | 2.0 | 154 | | | | | | | | 9.0 | 22 |
| SVJ | 80.8 | JUNCTION CR. BELOW CONFLUENCE WITH COPPER CLIFF BRANCH AND JUST ABOVE INLET TO KELLEY LAKE | SEPT.28/60 | 80.0 | 1362 | 344 | 1018 | 15 | 7.2 | 10.2 | 27.2 | 3.5 | | 80,000 |
| | | | DEC. 15/61 | 42.0 | 1504 | 412 | 1092 | | 7.0 | 25. | 39. | 44. | ACIDITY - 20 | 410 |
| | | | AUG. 16/61 | 12. | 1034 | 104 | 930 | 4 | 6.4 | 12.2 | 9.0 | 2.25 | | 0 |
| | | | MAY 5/61 | 65. | 1956 | 1192 | 764 | | 6.7 | | | | | |
| | | | MAY 18/61 | 21. | 1150 | 488 | 662 | | 4.4 | | 6.8 | 2.6 | | |
| | | | JUNE 16/61 | 12. | 1106 | 166 | 940 | | 6.5 | | | 7.2 | | |
| | | | JULY 4/61 | 30. | 996 | 232 | 764 | | 4.6 | 5.6 | | 2.5 | | |
| | | | JULY 18/61 | 34. | 1230 | 236 | 994 | | 6.3 | 12.8 | | 1.3 | | |
| | | | JULY 31/61 | 21. | 832 | 112 | 720 | | 6.6 | 8.4 | | 1.3 | | |
| | | | MAR. 21/63 | 52. | 876 | 125 | 751 | | 8.5 | | 5.2 | | | |
| | | | JUNE 3/63 | 20. | 1092 | | | | 4.7 | 59. | 8.0 | .26 | 26. | |

The City of Sudbury lies in the Junction Creek Watershed. Presently, the major portion of domestic sewage and industrial waste is discharged untreated and partially treated to Junction Creek. Contaminating wastes of varying concentrations are also discharged to Ramsey Lake, including the tributary lakes namely Minnow Lake, Pike Lake, and Mud Lake. Trout Lake and Robinson Lake also receive some contaminating wastes.

The bacterial quality of Junction Creek as it enters the city is satisfactory. However, the chemical analyses indicate high copper, nickel and iron concentrations. A number of outfalls carrying untreated and partially treated sewage were located along the course of the creek. The main outfall is the effluent from the Sudbury treatment works. Samples collected from the stream below the sewage treatment plant outfall show excessive BOD content and high coliform concentrations indicating pollution much in excess of the accepted standards. The elimination of the Sudbury sewage treatment plant and the use of the rock tunnel system merely transfers the major source of pollution to a point further downstream. Treatment of the sewage is necessary to reduce the pollution load on Junction Creek, When Junction Creek discharges to Kelley Lake it has a BOD much above stream quality standards and indicates unfavourable bacterial results in addition to high concentrations of copper, nickel and iron metals.

With the co-operation of the Sudbury and District Health Unit a total of twelve outfalls to Ramsey Lake were located and sampled in

1960. The majority of these outfalls are storm drains which carry wastes originating from unsewered areas surrounding the lake. The wastes are characteristic of septic tank effluent. These locations were not re-sampled during 1963 as conditions remain essentially unchanged.

In summarizing the analyses of samples collected it is noted that Minnow Lake Creek, St.Martial Creek, Lenox Street drain, Manor Street drain and the City Storm Creek were the most heavily polluted of the outfalls sampled. These results were similar to those found by the Sudbury & District Health Unit which maintains an extensive sampling program. In this regard it is anticipated that, after the present sewer construction program is completed, all sources of pollution affecting Ramsey Lake and the watercourses tributary to Ramsey Lake will be eliminated.

## IV RECOMMENDATIONS FOR WATER DEVELOPMENT

The City of Sudbury should undertake to develop water supplies for increasing municipal purposes in the annexed portion of the Township of Neelon from the available ground-water resources, while continuing to use the Ramsey Lake supply for the greater McKim area.

In the event that the available ground-water supplies will be unable to satisfy expanding municipal requirements in the future, active consideration should be given to developing the remaining resources of the watersheds of Ramsey Lake and Trout Lake. At that time, conservation will be required in order to exploit the resources of Trout Lake.

# V RECOMMENDATIONS FOR POLLUTION CONTROL

The municipality should continue to exert control over the sanitary disposal of waste water within the Ramsey Lake and Trout Lake Watersheds.

Consideration should be given to the construction of a municipal sewage treatment plant to reduce the pollution load on Junction Creek.

It is recommended that Doran's Northern Ontario Breweries Limited remove the hops from the sewered waste and dispose of it separately. It is envisaged that at such time as municipal sewage treatment is provided the wastes from the brewery be included. However, in order to reduce the organic loading on the plant the yeast could be separated, trucked to the plant and charged to the digester.

Consideration should be given to providing improved sewage treatment facilities at the INCO installations located at Murray Mine and Frood-Stobie Mines.

Recommendations regarding INCO's industrial waste discharges will be made in Part II of this report to be published at a later date.

# CHAPTER SIX

## TOWNS

### TOWN OF CAPREOL



### TOWN OF CHELMSFORD

## TOWN OF CONISTON



## TOWN OF COPPER CLIFF

## TOWN OF ESPANOLA

PAGE No.



## TOWN OF LEVACK

## TOWN OF LIVELY



## TOWN OF MASSEY



## TOWN OF WEBBWOOD

# CHAPTER 6 - TOWN OF CAPREOL

## I GENERAL

The Town of Capreol is situated in the north-east corner of the Sudbury Basin on the east side of the Vermilion River. The Canadian National operates a diesel fueling and watering station in addition to having divisional offices located here. Approximately 700 persons are employed by the CN at this location. The assessed population for 1963 is 2,973.

## II WATER SUPPLY

### 1. Source

A municipal water works system obtains water from four deep wells located in the south-east section of town.

The Canadian National has a private water supply system obtaining water from the Vermilion River for industrial purposes.

### 2. Treatment Works & Water Quality

No treatment of the water is provided. Two wells pump directly to the system and constitute the major source of supply. A third well discharges to a recharge pond between the major sources, thereby augmenting their production. The fourth well operates only as an emergency source due to its adverse chemical quality.

The total rated capacity of the system is 880 gpm or 1.26 mgd. The limiting capacity of the operating wells is 350 gpm or 0.5 mgd. The average daily pumpage during 1962 was 360,000 gallons.

The chemical quality of the wells is indicated by the following analyses:

TABLE 6 - 1

TOWN OF CAPREOL - WATER SUPPLY - CHEMICAL QUALITY

| LOCATION | DATE | HARDNESS AS $CaCO_3$ PPM | ALKALINITY AS $CaCO_3$ PPM | IRON AS Fe PPM | CHLORIDE AS Cl PPM | FLUORIDE AS F PPM | pH |
|---|---|---|---|---|---|---|---|
| WELL 1 OPERATING WELL | MAY 8/63 | 92 | 40 | 0.7 | 3 | 0 | 6.9 |
| WELL 2 OPERATING WELL | MAY 8/63 | 100 | 36 | 0.54 | 2 | 0 | 7.1 |
| WELL 3 STANDBY | MAY 8/63 | 78 | 34 | 2.7 | 5 | 0 | 6.8 |
| WELL 5 RECHARGE WELL | MAY 8/63 | 116 | 42 | 3.8 | 3 | 0 | 7.0 |

The iron content of all four wells is above the recommended limit of 0.3 ppm, consequently producing staining of fixtures and supporting the growth of iron bacteria in dead-ends on the system. Coloured water, tastes and odours associated with these organisms have been experienced periodically.

The iron concentrations in the water from wells No.3 and No.5 exhibit considerable fluctuations and have been as high as 3.2 ppm and 4.0 ppm respectively. Hydrogen sulphide is also present in well No.5.

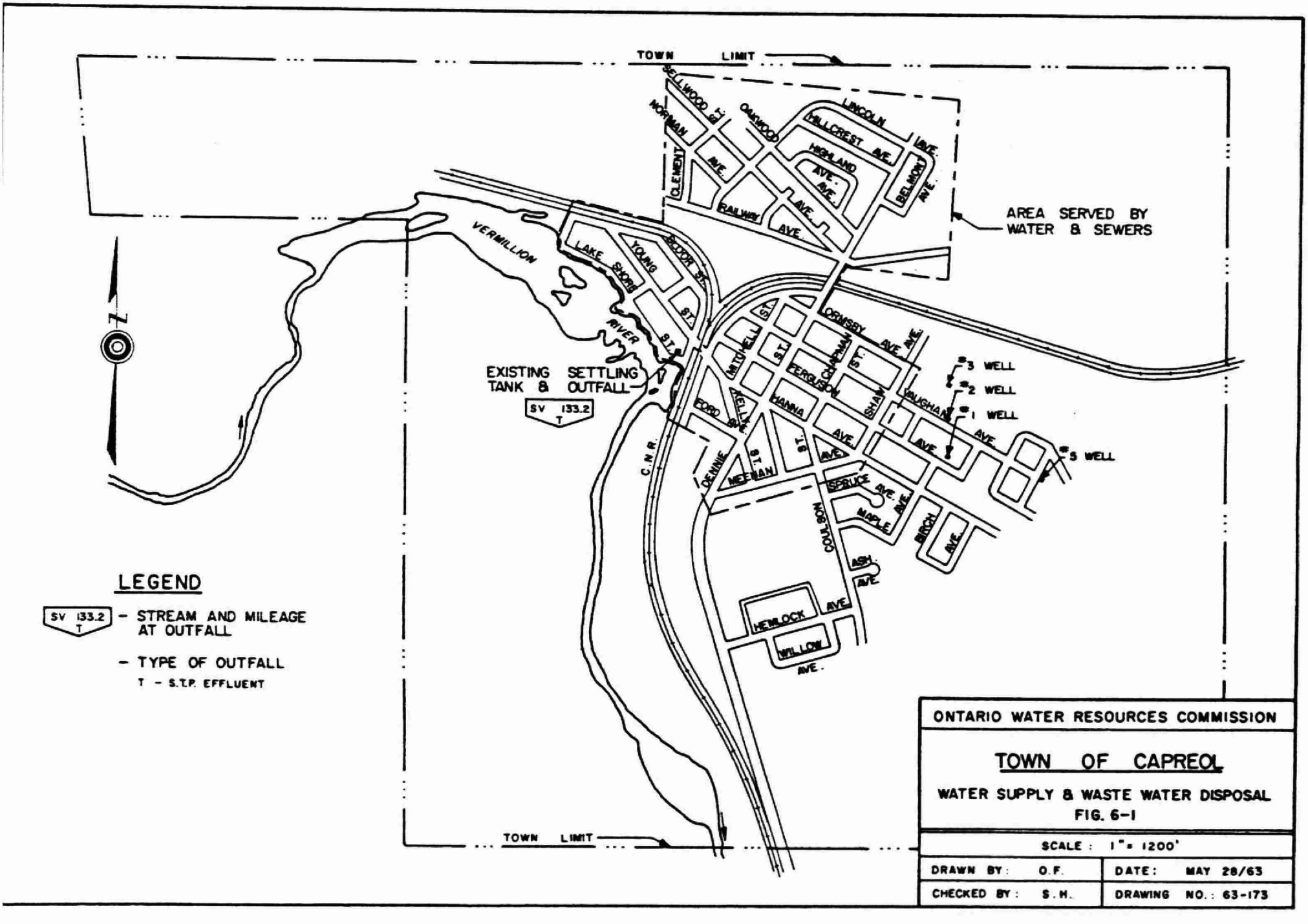
The bacteriological quality of the water is satisfactory.

3. Distribution

The outline of the distribution system is shown in Figure 6-1. Storage is supplied by a 214,000 gallon standpipe.

4. Water Requirements for the Future

Presently the existing well field appears to have sufficient capacity to meet present and future needs if treatment to reduce the


TOWN LIMIT
AREA SERVED BY WATER & SEWERS
VERMILLION RIVER
LAKE SHORE
YOUNG
BOOTH ST.
RAILWAY
CLEMENT
NORMAN
OAKWOOD
LINCOLN
HILLCREST AVE.
HIGHLAND AVE.
BELMONT AVE.
ORMSBY AVE.
MITCHELL ST.
FERGUSON
CHAPMAN ST.
ISHAM
VAUGHAN
HANNA
FORD
KELLY
DENNIE
MEEHAN ST.
C.N.R.
COLLEGE
SPRUCE AVE.
MAPLE AVE.
BIRCH AVE.
ASH AVE.
HEMLOCK AVE.
WILLOW AVE.
EXISTING SETTLING TANK & OUTFALL
SV 133.2 T
3 WELL
2 WELL
1 WELL
5 WELL
TOWN LIMIT
LEGEND
SV 133.2 T - STREAM AND MILEAGE AT OUTFALL
- TYPE OF OUTFALL
T - S.T.P. EFFLUENT
ONTARIO WATER RESOURCES COMMISSION
TOWN OF CAPREOL
WATER SUPPLY & WASTE WATER DISPOSAL
FIG. 6-1
SCALE : 1" = 1200'
DRAWN BY : O.F.
DATE : MAY 28/63
CHECKED BY : S.H.
DRAWING NO. : 63-173

high iron content is provided. Alchem Limited recommended the use of polyphosphate to sequester the iron. International Water Supply Limited recommended, on the basis of a pilot plant study, the provision of forced draft aeration, sedimentation, and pressure filtration. OWRC reports have recommended the installation of iron removal facilities.

Based on the population growth during the past 10 years the water demand by 1980 should exceed 0.44 mgd.

5. Potential Additional Water Supplies

Large potential supplies are indicated from both ground water and surface water in the Capreol area. Some of the sources have chemical and/or bacterial qualities that will require treatment to provide water of high quality to the town. The selection of a source to meet increased future demands will be governed largely by the cost of treatment and transmission.

Extensive deposits of sand and gravel in the Capreol area indicate that ground water is capable of supplying much more water to the town. The high iron content in the town wells indicates that near the town, it will be difficult to secure water with a satisfactory iron content.

Three sources for increased ground-water supplies have been investigated in some detail. These are the existing Capreol well field, the CN Suez gravel pit south of Onwatin Lake, and an old channel of the Vermilion River at the north-west end of the railway marshalling yard. The results of chemical analysis and

bacterial examination of water samples from these sources indicate that the ground water in the town well field and the old river channel is soft, slightly acidic, and has an iron content well in excess of the recommended maximum of 0.3 ppm.; whereas the water from the CN Suez gravel pit is slightly harder, slightly alkaline, and has an iron content less than the recommended maximum of 0.3 ppm.

## III WATER POLLUTION

### 1. Sanitary Waste Disposal

#### (a) Existing Conditions

Sanitary sewage from the town flows by gravity through combined sewers to a 36,000-gallon septic tank overflowing to the Vermilion River. The outline of the sewered area is shown in Figure 6-1.

#### (b) Proposed Sewage Works

Preliminary approval of a three-cell, 26-acre lagoon was issued by the Commission in 1961. The project included a pumping station located on the site of the present septic tanks, delivering to the lagoon on the west side of the Vermilion River. No further action in this regard has been taken by the municipality.

### 2. Industrial Waste Survey

Cooling water and boiler blowdown from the CN operations discharges to the Vermilion River. Most of the drainage water of the yard area, in addition to water and oil spillage from the diesel servicing area, is collected in two systems of drains each leading to a small separator. The effluents flow to the Vermilion River.

TABLE 6 - 2

VICINITY OF CAPREOL - STREAM AND OUTFALL SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | pH AT LAB. | TURBIDITY IN SILICA UNITS | IRON AS Fe (PPM) | M.F.COLIFORM COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|
| SV 137.6 | VERMILION R. AT FOOT OF BASS LAKE WEST & UPSTREAM OF CAPREOL | OCT. 3/60 | 2.3 | 56 | | | | 81 |
| | | JUNE 3/63 | 0.3 | 64 | 7.0 | 2.1 | 0.41 | 12 |
| SV 133.2-S | CAPREOL SEPTIC TANK EFFLUENT | NOV. 9/62 | 120 | 318 | | | | |
| | | JUNE /63 | 37 | 320 | | | | 400,000,000 |
| SV 134.2 | VERMILION R. DOWNSTREAM FROM CAPREOL | OCT. 3/60 | 2.2 | 76 | 7.7 | | 2 | 5,700 |
| | | AUG. 16/61 | 1.2 | 50 | | | 1 | 40 |
| | | AUG. 8/62 | 1.8 | 64 | | | 1.4 | 14,900 |
| | | JUNE 5/63 | 1.0 | 86 | | | 1.7 | 2,500 |

Samples obtained on June 6, 1963, indicated phenol concentrations of 20 ppb and 2 ppb from the two drains; which is generally satisfactory.

3. Surface Water Quality

The effect of the submerged outlet from the municipal septic tank on the water quality of the Vermilion River is indicated by the results listed in Table 6-2.

The discharge of the inadequately treated sewage from the Town of Capreol significantly increases the bacterial concentrations of the Vermilion River.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

It is recommended that iron removal treatment be provided on the municipal wells.

V RECOMMENDATIONS FOR POLLUTION CONTROL

It is recommended that the Town of Capreol provide the sewage lagoon as approved by the OWRC in 1961.

## TOWN OF CHELMSFORD

I GENERAL

Chelmsford, a residential town with approximately 2,600 residents is located on the banks of Whitson River north-west of the City of Sudbury.

II WATER SUPPLY

1. Source

Water is obtained from Whitson River.

2. Treatment Works and Water Quality

The pumping station is equipped with low lift and high lift pumps. Treatment consists of pre-chlorination, coagulation with aluminum sulphate, sedimentation, filtration(anthrafilt) and post-chlorination. The system is designed for 200 U.S. gpm. The average daily pumpage during 1962 was 130,000 gallons with a maximum daily pumpage of 227,500 gallons on March 10, 1963.

The average results of the chemical analyses and the median results of the bacteriological examinations of samples taken monthly during 1962 are given in Table 6-3.

TABLE 6 - 3

CHEMICAL ANALYSES

| Source | Raw Water | Treated Water |
|---|---|---|
| Hardness as $CaCO_3$ ppm | 143 | 140 |
| Alkalinity as $CaCO_3$ ppm | 96 | 86 |
| Iron..... as Fe ppm | 0.66 | 0.32 |
| Chloride.. as Cl ppm | 6 | 9 |
| pH at Lab. | 7.7 | 7.4 |
| Colour in Hazen Units | 25 | 11 |
| Turbidity in Silica Units | 3.2 | 2.6 |
| M.F. Coliforms Count/100 ml | 47 | 0 |

The treated water is satisfactory.

3. Distribution

The distribution system is outlined on Figure 6-2. Storage is provided by a 95,000 Imperial gallon standpipe. There are approximately 500 services.

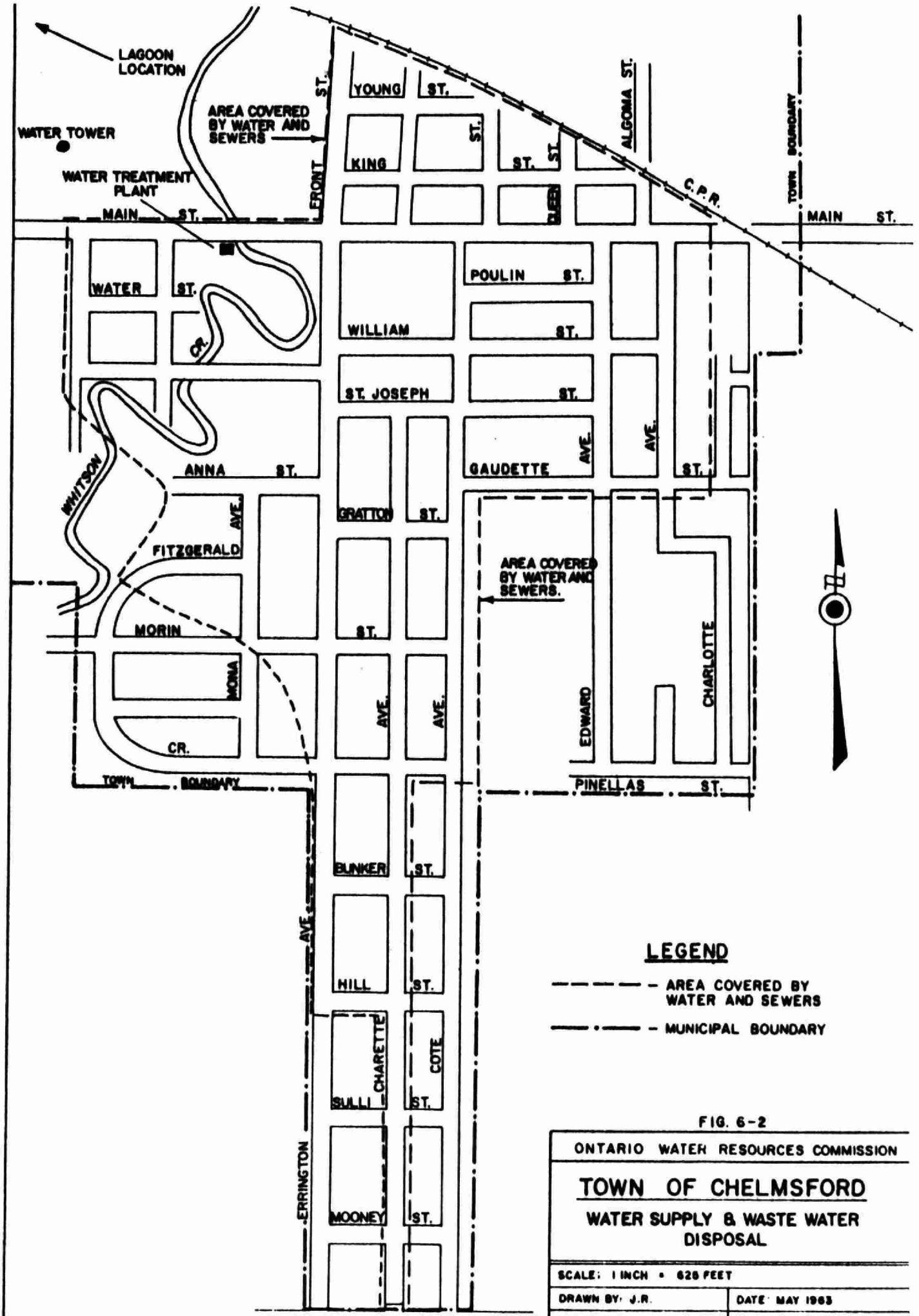



FIG. 6-2

ONTARIO WATER RESOURCES COMMISSION

# TOWN OF CHELMSFORD

## WATER SUPPLY & WASTE WATER DISPOSAL

| | |
|---|---|
| SCALE: 1 INCH = 625 FEET | |
| DRAWN BY: J.R. | DATE: MAY 1963 |
| CHECKED BY: | DRAWING - No 63 - 174 |

4. Water Requirements for the Future

If the population trend is to continue, the water demand by 1980 is expected to be 200,000 gpd with a maximum of 320,000 gpd. The system will not be adequate to meet these demands unless additional sedimentation and filtration capacity is provided.

5. Potential Additional Water Supplies

Three test-holes drilled for the Town of Chelmsford in 1948 in the town and Balfour Township showed an alternating succession of sandy loam, fine sand, and clay to depths of 76 to 145 feet. In two holes, boulders and clay rest on the bedrock. The holes failed to encounter water in quantities suitable for a municipal supply. Private drilled wells in Balfour Township have a similar succession which yields only small quantities of water. A few holes drilled into bedrock also yield only small quantities of water. The available information reveals that ground-water conditions are not favourable.

III WATER POLLUTION

1. Waste Disposal

Sanitary waste is discharged to a ten-acre lagoon located in Balfour Township. Treatment efficiency of approximately 90 per cent removal for both BOD and suspended solids is effected resulting in an effluent to McKenzie Creek with average BOD and suspended solids concentrations of approximately 35 ppm. No other outfalls were located in Chelmsford.

2. Surface Water Quality

Reference should be made to Balfour Township described in Chapter 7 for an indication of the local surface water quality.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

Additional sedimentation and filtration capacity should be provided for future water demand.

V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations in this respect at this time.

## TOWN OF CONISTON

I GENERAL

The Town of Coniston, which was incorporated in 1934, lies adjacent to, and south of, the Trans Canada Highway #17, approximately eight miles east of the City of Sudbury. The International Nickel Company of Canada Limited operates the Coniston smelter within the limits of the municipality. The 1963 population of Coniston is 2,705. Future population increases in the municipality will probably be dependent upon the requirements for staff at the INCO smelter in Coniston.

II WATER SUPPLY

1. Source

INCO operates a pumphouse on the Wanapitei River just below the hydro dam. The Town of Coniston receives its water from a connection to the industrial supply line.

2. Treatment Works and Water Quality

Chlorination is the only form of treatment provided. The results of a sample of the raw water is recorded in Table 6-4.

TABLE 6 - 4

TOWN OF CONISTON - WATER SUPPLY - CHEMICAL QUALITY

| Hardness as $CaCO_3$ | Alkalinity as $CaCO_3$ | Iron as Fe | Chlorides as Cl | Fluorides as Fl | Colour (Hazen Units) | Turbidity (Silica Units) | M.F.Coliforms per 100 ML. |
|---|---|---|---|---|---|---|---|
| 40 | 16 | .87 | Trace | .1 | 25 | 3.5 | 24 |

The turbidity and colour of the water is subject to considerable variation depending upon run-off and the periodic opening of the control gates of the hydro dam.

The normal average water consumptions vary between 75 and 95 gpm or 110,000 to 140,000 gpd.

3. Distribution

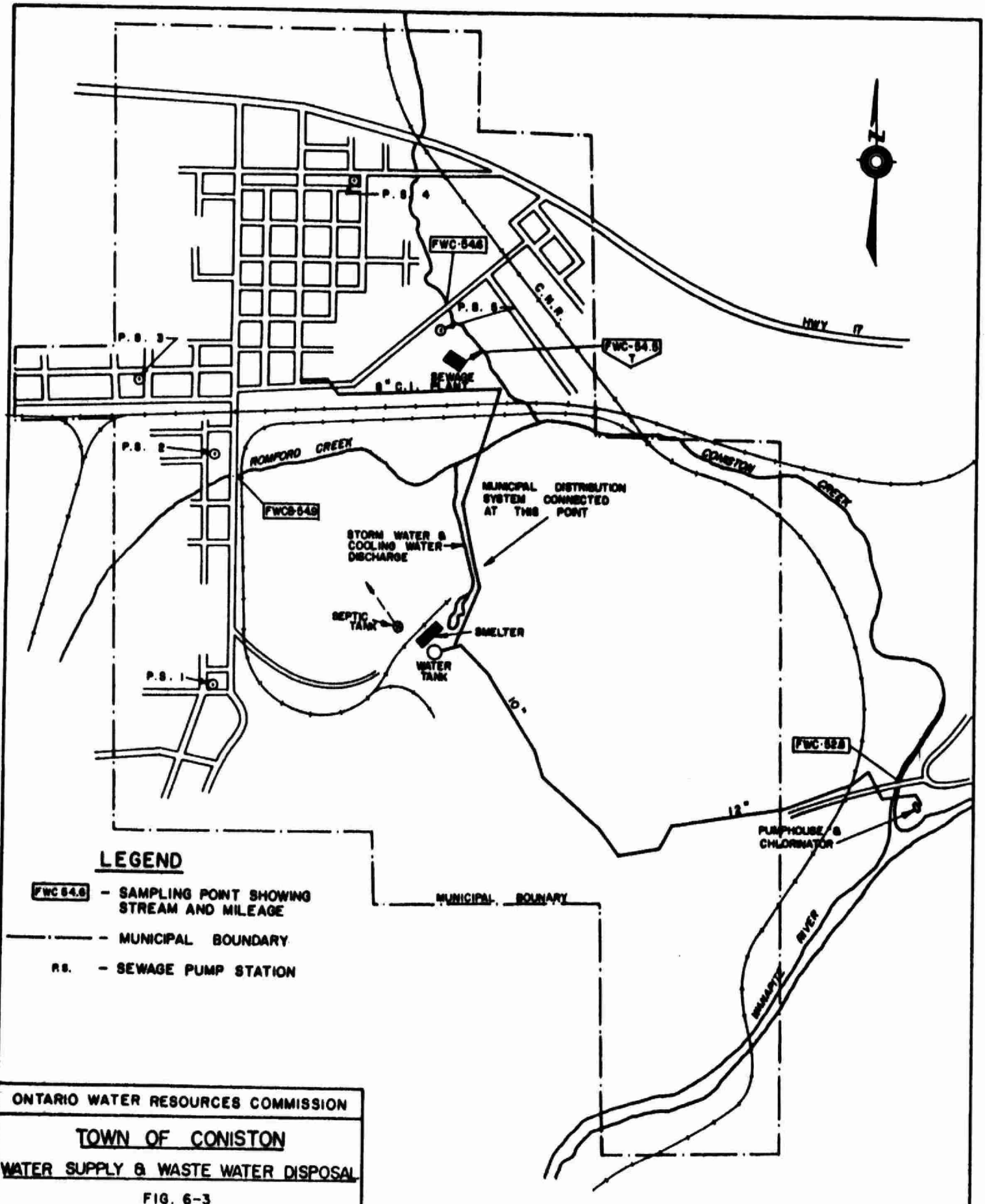
The municipal distribution system commences at a point near the smelter. There is a meter at the beginning of the 12-inch cast iron main. This main is two miles long and feeds about five miles of distribution mains. The previously used two-inch mains have been replaced with adequately sized mains.

A 130,000-gallon storage tank is situated at the smelter site.

The system includes 563 domestic services and 70 commerical services.

4. Water Requirements for the Future

INCO has an agreement with the Town of Coniston relative to the quantity of water that can be drawn from the industrial supply.




| ONTARIO WATER RESOURCES COMMISSION | |
|---|---|
| TOWN OF CONISTON | |
| WATER SUPPLY & WASTE WATER DISPOSAL | |
| FIG. 6-3 | |
| SCALE. 4" = 1 MILE | |
| DRAWN BY : O.F. | DATE. JUNE 12/63 |
| CHECKED BY : | DRAWING NO.: 63-179 |

There are no apparent problems in regard to water shortages and the surface supply is considered adequate.

5. Potential Additional Water Supplies

Coniston is in a low area of fine sands, silts and clays deposited between bedrock hills. Small pockets of gravel lie against the bedrock hills but these are of minor extent. The possibilities for the presence of large ground-water supplies near Coniston are poor.

III WATER POLLUTION

1. Sanitary Waste Disposal

All the sanitary sewage in Coniston, including sewage from the smelter, is discharged to the municipal separate sewer system which employs five sewage pumping stations. The location of the pumping stations are shown on Figure 6-3. An activated sludge sewage treatment plant is owned and operated by the Ontario Water Resources Commission on behalf of the municipality. The plant was designed for a dry weather flow of 150,000 gallons per day or a population of 2,500 at 60 gallons per capita per day. The sludge is conditioned in a digester and dried on a sludge drying bed. Primary treatment facilities can treat 260,000 gallons per day. The plant effluent is chlorinated during the summer months and is subsequently discharged downstream from the Coniston water works intake to Coniston Creek, tributary of the Wanapitei River. The average results of the composite samples collected during 1962 are recorded as follows.

TABLE 6 - 5

TOWN OF CONISTON - SEWAGE TREATMENT PLANT EFFICIENCY

| Raw Influent | | Final Effluent | | % Removal | |
|---|---|---|---|---|---|
| B.O.D. (PPM) | Suspended Solids | B.O.D. (PPM) | Suspended Solids | B.O.D. (PPM) | Suspended Solids |
| 274 | 326 | 51 | 55 | 81.8 | 83.1 |

The removal efficiencies are generally satisfactory for this type of treatment. However, the effluent analysis indicates BOD and suspended solids concentrations in excess of OWRC objectives.

2. Industrial Waste Disposal

The International Nickel Company operates a smelter within the town. This smelter processes ore from Creighton and Levack Mines and employs approximately 700 persons. The waste discharge from the smelter is almost entirely cooling water and amounts to approximately 2 mgd. This waste is discharged to Romford Creek which feeds Coniston Creek, a tributary of the Wanapitei River.

3. Surface Water Quality

The Coniston sewage treatment plant did not affect the quality of Coniston Creek or the Wanapitei River according to grab samples collected on June 4, 1963.

TABLE 6 - 6

VICINITY OF CONISTON - STREAM SAMPLES

| Sample Point No. | | 5-Day B.O.D. (PPM) | Total Solids (PPM) | Turbidity in Silica Units | M.F. Coliforms per 100 ml. |
|---|---|---|---|---|---|
| FW 53.0 | Wanapitei River at Power Dam | 0.8 | 120 | 2.5 | 30 |
| FWC 52.8 | Coniston Creek at road just above junction | 1.0 | 236 | 7.5 | 20 |
| FW 45.2 | Wanapitei River at bridge, St. Cloud | 1.0 | 140 | 6.5 | 20 |

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations in this respect at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations in this respect at this time.

## TOWN OF COPPER CLIFF

I GENERAL

The Town of Copper Cliff is situated adjacent to, and partly surrounded on its northern, southern and eastern limits by the City of Sudbury. The townsite and more than one-half of the buildings are owned by INCO. The company's main offices, smelter and copper refinery are situated in the town. The population of the municipality has remained somewhat constant; the present figure is 3,789. The water supply and distribution system and the sewage collection and treatment works are owned and operated by INCO.

II WATER SUPPLY

1. Sources

Water supply is obtained from three sources; (1) the Lady Macdonald supply which is maintained on a standby basis, (2) the Vermilion River system which is the main source of water supply for municipal and industrial purposes and (3) the Kelley Lake supply. In an emergency, water can also be taken from Meatbird Lake.

The Vermilion River system employs a pumphouse on the Vermilion River and conveys the water to the Meatbird Lake overflow installation. Water pumped from the Vermilion River and not used at Copper Cliff

overflows at this point. A gravity intake has been installed at Meatbird Lake to provide an emergency supply for Copper Cliff. The Vermilion River system also supplies the iron ore recovery plant and the copper refinery.

Kelley Lake water is used without treatment for fire-fighting and process requirements at the smelter and the copper refinery.

2. Treatment Works and Water Quality

The Vermilion River water is chlorinated at booster pumping stations located at the iron ore recovery plant, the copper refinery and the Copper Cliff pumphouse which supplies the needs of the town and the smelter operations. Chlorination equipment is provided at the Lady Macdonald supply works.

The chemical analyses of a typical raw water sample of the Vermilion River supply is given below:

TABLE 6 - 7

TOWN OF COPPER CLIFF - WATER SUPPLY - CHEMICAL QUALITY

| DATE | HARDNESS AS $CaCO_3$ (PPM) | ALKALINITY AS $CaCO_3$ (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | pH AT LAB. | COLOUR IN HAZEN UNITS | TURBIDITY IN SILICA UNITS |
|---|---|---|---|---|---|---|---|
| MARCH 4/63 | 64 | 32 | 0.90 | 3 | 7.5 | 20 | 7.5 |

The water is soft but contains concentrations of iron, colour, and turbidity above the recommended limits for potable water supplies. The recommended limits for iron, colour, and turbidity are 0.3 ppm, 15 Hazen Units and 5 Silica Units respectively.

3. Distribution

The 1,000,000 U.S. gallon standpipe operates in conjunction with the pumps in the Copper Cliff pumphouse. There are 980 domestic services that benefit from the system.

4. Water Requirements for the Future

The present sources of water supply are adequate. Municipal water requirements have not varied considerably over the years due to the constant population. Population increases in the town are not anticipated.

5. Potential Additional Water Supplies

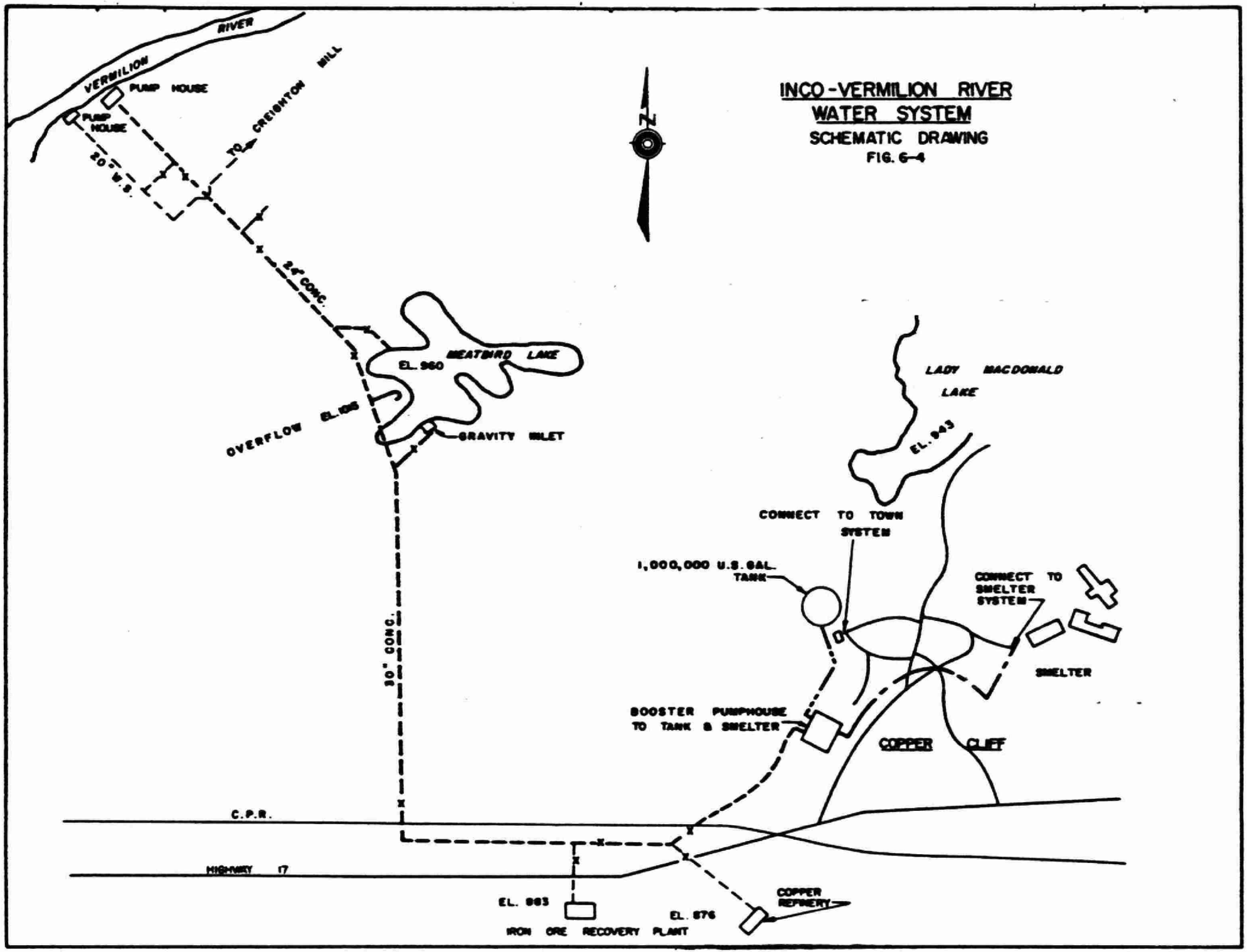
No records are on file for wells drilled in the Town of Copper Cliff. The geology of neighbouring townships suggests that water-bearing sand and gravel deposits may be present below the clay and silt plains bordering Highway #17. A limited program of test-drilling would be needed to test this theory and determine the chemical quality of ground water supplies.

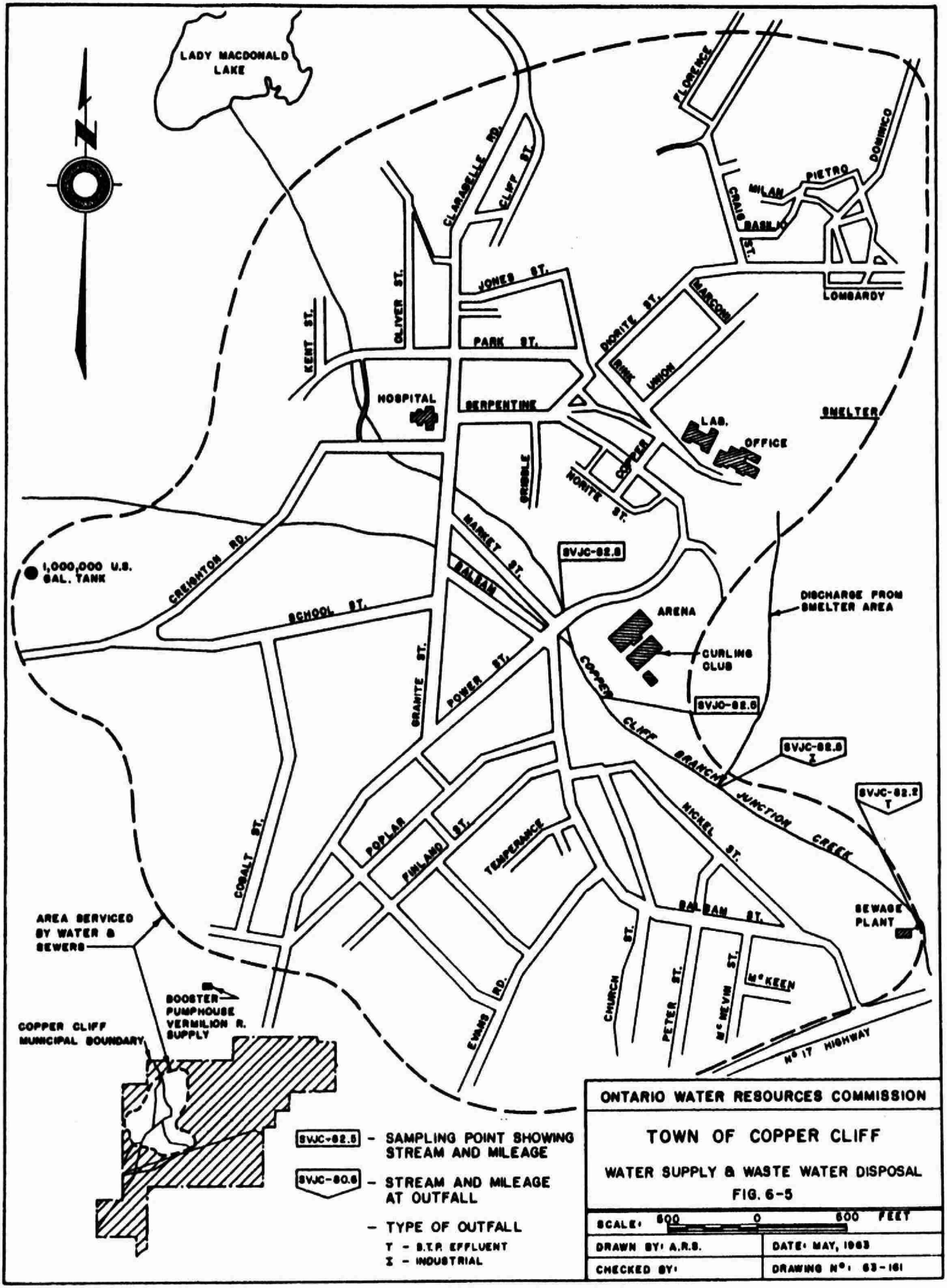
III WATER POLLUTION

1. Sanitary Waste Disposal

A system of sanitary sewers conveys the sewage flow from the municipality, the Copper Cliff North Mine, and the smelter to a 1.5 mgd activated sludge sewage treatment plant. The present sewage flows are approximately 1.0 mgd.

Generally, the sewage treatment plant has been producing an effluent of acceptable quality. The chlorinated effluent is discharged to Copper Cliff Creek. Two sewage lift stations are employed to overcome topographical limitations.


INCO-VERMILION RIVER
WATER SYSTEM
SCHEMATIC DRAWING
FIG. 6-4
N
VERMILION RIVER
PUMP HOUSE
PUMP HOUSE
TO CREIGHTON MILL
20" W.S.
24" CONC.
EL. 960
MEATBIRD LAKE
OVERFLOW EL. 956
GRAVITY INLET
30" CONC.
LADY MACDONALD LAKE
EL. 943
CONNECT TO TOWN SYSTEM
1,000,000 U.S. GAL. TANK
CONNECT TO SMELTER SYSTEM
SMELTER
BOOSTER PUMPHOUSE TO TANK & SMELTER
COPPER CLIFF
C.P.R.
HIGHWAY 17
EL. 883
IRON ORE RECOVERY PLANT
EL. 876
COPPER REFINERY


LADY MACDONALD LAKE
N
CLARABELLE RD.
CLIFF ST.
FLORENCE
DOMINICO
PIETRO
MILAN
CRAIG
BARLOW
ST.
LOMBARDY
JONES ST.
OLIVER ST.
KENT ST.
PARK ST.
DIORITE ST.
MARCONI
RING
UNION
HOSPITAL
SERPENTINE
SMELTER
LAB.
OFFICE
GRIBBLE
NORITE ST.
COPPER
MARKET ST.
SVJC-82.8
BALSAM
CREIGHTON RD.
1,000,000 U.S. GAL. TANK
SCHOOL ST.
ARENA
DISCHARGE FROM SMELTER AREA
CURLING CLUB
GRANITE ST.
POWER ST.
COPPER CLIFF BRANCH
SVJC-82.6
SVJC-82.5 I
SVJC-82.2 T
JUNCTION CREEK
NICKEL ST.
COBALT ST.
POPLAR
FINLAND ST.
TEMPERANCE
BALSAM ST.
SEWAGE PLANT
AREA SERVICED BY WATER & SEWERS
BOOSTER PUMPHOUSE VERMILION R. SUPPLY
COPPER CLIFF MUNICIPAL BOUNDARY
CHURCH ST.
PETER ST.
McKEEN
McKEVIN ST.
EVANS RD.
No 17 HIGHWAY
SVJC-82.5 - SAMPLING POINT SHOWING STREAM AND MILEAGE
SVJC-80.6 - STREAM AND MILEAGE AT OUTFALL
- TYPE OF OUTFALL
T - S.T.P. EFFLUENT
I - INDUSTRIAL
ONTARIO WATER RESOURCES COMMISSION
TOWN OF COPPER CLIFF
WATER SUPPLY & WASTE WATER DISPOSAL
FIG. 6-5
SCALE: 600 0 600 FEET
DRAWN BY: A.R.S.
DATE: MAY, 1963
CHECKED BY:
DRAWING No: 63-161

Sanitary sewage treatment at the Copper Refinery is accomplished by means of a septic tank and tile bed system serving the Acid Plant. A 40,000 gpd activated sludge sewage treatment plant serves the major portion of the refinery. The effluent is discharged to a tributary of Copper Cliff Creek.

2. Industrial Waste Disposal

A large portion of International Nickel Company operations are located in the Town of Copper Cliff. These operations include concentrating, smelting, and copper refining.

Canadian Industries Limited operates a plant producing liquid sulphur dioxide and sulphuric acid.

The concentrator in Copper Cliff handles approximately 50,000 tons of ore per day from all mines except the Creighton and Levack mines. The copper nickel concentrate produced in the concentrator is further processed in the smelter to produce copper and nickel mattes for refining. Approximately 6,100 persons are employed in the concentrator and smelter which are operated continuously.

The tailings from the concentrator are thickened and passed on to a central tailings disposal area to the west of Copper Cliff. The overflow from the thickeners is re-used in the plant while the overflow from the tailings disposal area (approximately 3.7 mgd), flows to Copper Cliff Creek. All wastes from the Copper Cliff smelter are discharged to a common sewer to the south of the plant and thence to Copper Cliff Creek.

The copper refinery employs approximately 900 persons and produces all of INCO's refined copper in this country. All the process and storm water flows from this division are collected in a common system with the sanitary sewage disposal plant effluent and are discharged to a tributary of Copper Cliff Creek.

The Canadian Industries Limited were in the process of changing operations. The proposed alterations that would affect waste water discharges involve the location of all acid production at Plant #2 located in the Township of Waters and all liquid sulphur dioxide production at Plant #1 at Copper Cliff. The present operating conditions are discussed in this report.

In Plant #1, 35 tons per day of sulphuric acid and 250 tons per day of liquid sulphur dioxide are produced. The plant operates continuously. Cooling water and weak sulphuric acid scrubbing water amounting to approximately 25 gpm, is discharged to INCO's old slag disposal area. At this point, it joins a waste stream from INCO and proceeds to Copper Cliff Creek. Lime is added to the waste flow on infrequent occasions to inhibit corrosion. Plant #2 is located in the organized Township of Waters and consequently will be discussed in Chapter VII.

Industrial operations at Copper Cliff will be discussed in more detail in Part II of this report to be issued at a later date.

3. Surface Water Quality

Copper Cliff Creek, the Copper Cliff branch of Junction Creek, flows from Lady Macdonald Lake through the Town of Copper Cliff and

TABLE 6 - 8

VICINITY OF COPPER CLIFF - STREAM & OUTFALL SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | pH AT LAB. | NICKEL AS Ni (PPM) | COPPER AS Cu (PPM) | IRON AS Fe (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SVJC 83.8-1 | INCO COPPER REFINERY CREEK AT HWY.#17 | SEPT. 28/60 | 6 | 1008 | 32 | 976 | 5.0 | 3.6 | 2.7 | 0 | | 180 |
| | | JUNE 5/63 | 6.0 | 884 | - | - | - | - | - | - | | 70 |
| SVJC 82.8 | TAILINGS CREEK | SEPT. 28/60 | 13 | 3904 | 2504 | 1480 | 6.0 | | 3.5 | 88. | | 170 |
| | | JUNE 3/63 | 19. | 1492 | 47 | 1445 | 6.7 | - | - | 1.68 | | - |
| SVJC 82.8-1 | COPPER CLIFF NORTH MINE EFFLUENT | JUNE 7/63 | | 608 | 67 | 541 | 7.5 | 3.7 | 1.0 | 2.98 | | |
| SVJC 82.8 | COPPER CLIFF BRANCH FROM LADY MACDONALD LAKE | SEPT. 28/60 | 16 | 1886 | 76 | 1810 | 4.0 | - | 0.6 | 64 | | 10 |
| | | JUNE 3/63 | 3.8 | 1636 | - | - | 3.3 | | | 58.0 | 59 | 10 |
| SVJC 82.5-1 | INCO SMELTER EFFLUENT | SEPT. 28/60 | 8. | 4586 | 1934 | 2652 | 9.9 | 23.2 | 2.5 | 32 | | 300 |
| | | JUNE 3/63 | 6.8 | 1170 | 114 | 1056 | 4.0 | 19.5 | 15.5 | 0.8 | | |
| SVJC 82.2T | COPPER CLIFF S.T.P. EFFLUENT (SUMMARY OF 21 SAMPLES - 1962) | | 11. | | 33 | | | | | | | AVG. |
| | | | 35. | | 60 | | | | | | | HIGH |
| | | | 1. | | 4 | | | | | | | LOW |
| SVJC 81.9 | COPPER CLIFF CR. AT HWY.#17 BELOW S.T.P. | JUNE 21/60 | 15 | 1308 | 64 | 1244 | 3.7 | 4.1 | 2.1 | 26 | | 1,000 |
| | | SEPT. 28/60 | 12 | 1650 | 292 | 1358 | 6.4 | 10.4 | 2.25 | 7.6 | | 20 |
| | | AUG. 16/61 | 25 | 1308 | 130 | 1178 | | | | | | 0 |
| | | AUG. 1/62 | 12 | 1550 | - | - | 3.9 | 15. | 11.0 | 15.0 | | < 100 |
| | | APR. 10/61 | 34 | 1544 | 244 | 1300 | | | | | | |
| | | JUNE 3/63 | 16 | 1340 | | | 5.6 | 5.7 | 1.9 | 9.2 | 50 | 50 |

discharges to Junction Creek, south of the town.

Discharges to Copper Cliff Creek and tributaries include the mine water from Copper Cliff North Mine, located in the City of Sudbury, the Copper Cliff tailings overflow, the sewage treatment plant effluent, associated trade wastes from the Copper Refinery, and miscellaneous wastes discharges from the smelter operations including the CIL Plant #1 and the Copper Cliff sewage treatment plant effluent. The analyses of samples collected are presented in Table 6-8. An examination of these results indicates that high concentrations of copper, nickel and iron metals combined with high suspended solids and excessive BOD contents are present in Copper Cliff Creek. The pH also indicates the stream to be acidic, which is attributed to industrial waste discharges originating from INCO operations at Copper Cliff.

## IV RECOMMENDATIONS FOR WATER DEVELOPMENT

The sources of supply appear to be quite adequate for present and future demands. There are no recommendations at this time.

## V RECOMMENDATIONS FOR POLLUTION CONTROL

Recommendations regarding the industrial waste discharges will be made in Part II of this report to be published at a later date.

There are no recommendations at this time regarding sanitary waste disposal or treatment.

# TOWN OF ESPANOLA

## I GENERAL

Espanola has a population of 5,360 and is located on the banks of the Spanish River near the south-west corner of the District of Sudbury. The major industry is the KVP Company Limited which operates its own water and waste disposal systems. The only other industry, the Espanola Dairy, is served by the municipal water and sewerage systems. Both the water works and the sewage treatment plant are owned and operated by the Ontario Water Resources Commission on behalf of the municipality.

## II WATER SUPPLY

### 1. Source

The municipal supply is obtained from Apsey Lake and the KVP supply is obtained from the Spanish River.

### 2. Treatment Works and Water Quality

The municipal pumping station has a pumping capacity of 1,668 U.S. gpm or a design capacity of 5,000 persons. The treatment consists of gas chlorination. The average daily pumpage is approximately 200,000 gallons and the maximum daily pumpage approximates 600,000 gallons.

The KVP water works system supplies the mill with filtered and chlorinated water for industrial and domestic purposes. The pumping station has a capacity of 7,500 U.S. gpm and an associated reservoir has a capacity of 500,000 gallons.

The chemical quality of the water is recorded in Table 6-9.

TABLE 6 - 9

TOWN OF ESPANOLA - WATER SUPPLY - CHEMICAL QUALITY

| LOCATION | DATE SAMPLED | HARDNESS AS $CaCO_3$ (PPM) | ALKALINITY AS $CaCO_3$ (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | pH AT LAB. | COLOUR IN HAZEN UNITS | TURBIDITY IN SILICA UNITS |
|---|---|---|---|---|---|---|---|---|
| APSEY LAKE | NOV. 14/62 | 34 | 16 | .16 | 10 | 7.3 | 5 | 2.0 |
| SPANISH R. RAW | JUNE 16/60 | 50 | 12 | .08 | 0 | 7.5 | 25 | 2.0 |
| SPANISH R. TREATED | JUNE 16/60 | 44 | 10 | 0 | TRACE | 6.9 | 15 | 2.0 |

The water from Apsey Lake and the Spanish River is soft. The chemical and bacteriological quality of the treated municipal water, is satisfactory. It is noted that the Spanish River water is more highly coloured than Apsey Lake water. The treated KVP water has good bacteriological quality.

3. Distribution

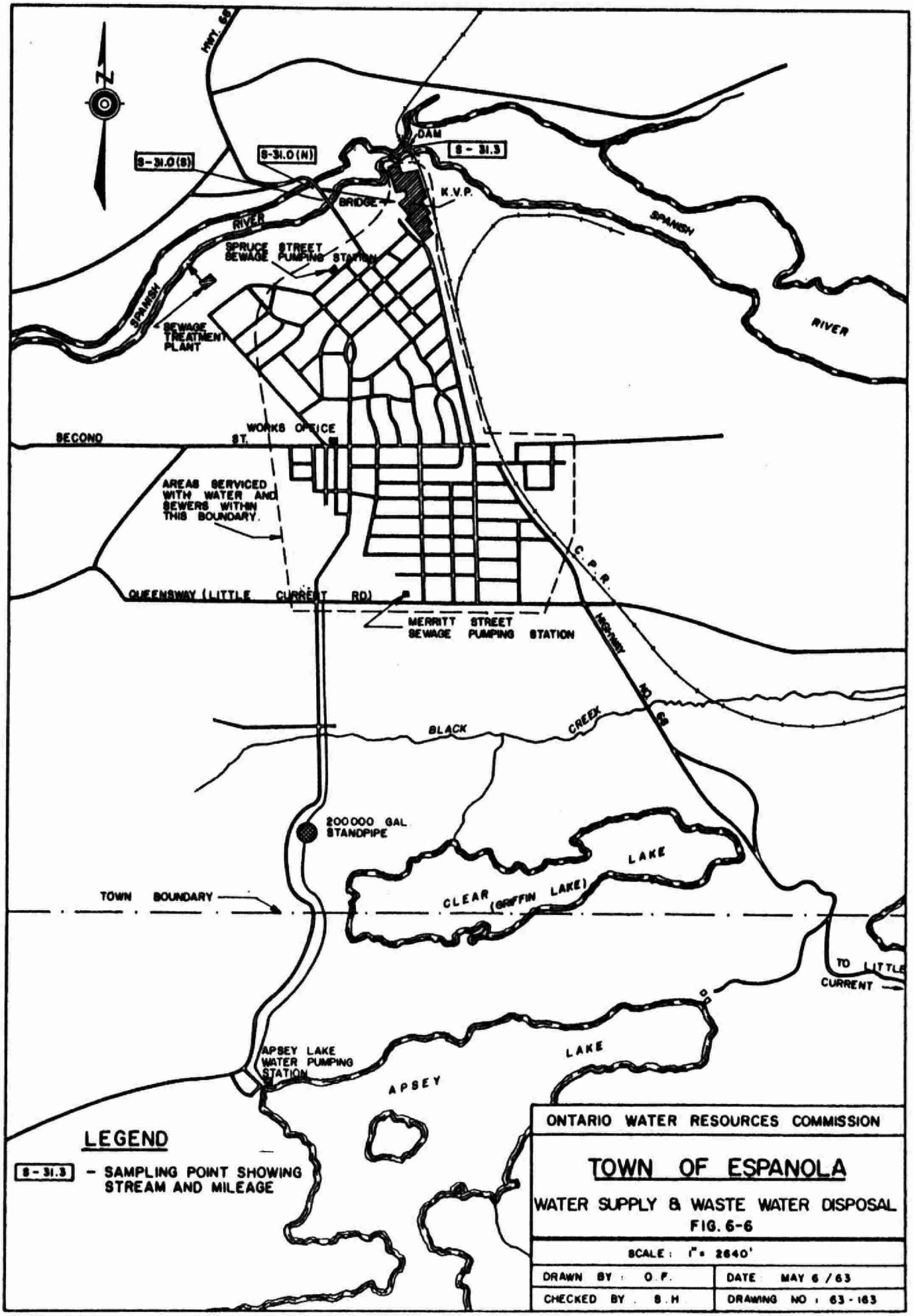
The extent of the municipal system is outlined on Figure 6-6. A 200,000-gallon standpipe is provided for storage. There are approximately 1,000 services.

4. Water Requirements for the Future

The supply is adequate for future demand but the system is designed for 5,000 persons. Population growth is primarily dependent on future expansion of the KVP Company plant.

5. Potential Additional Water Supplies

In 1959, International Water Supply Limited carried out a test-drilling program for the town. Five test holes were drilled within a radius of 3,600 feet. The drilling proved the existence of a


N
HWY. 65
DAM
S-31.0(S)
S-31.0(N)
S-31.3
BRIDGE
K.V.P.
SPANISH
RIVER
SPRUCE STREET SEWAGE PUMPING STATION
SEWAGE TREATMENT PLANT
WORKS OFFICE
SECOND ST.
AREAS SERVICED WITH WATER AND SEWERS WITHIN THIS BOUNDARY.
QUEENSWAY (LITTLE CURRENT RD)
MERRITT STREET SEWAGE PUMPING STATION
C.P.R.
HIGHWAY NO. 68
BLACK CREEK
200000 GAL STANDPIPE
LAKE
CLEAR (GRIFFIN LAKE)
TOWN BOUNDARY
TO LITTLE CURRENT
APSEY LAKE WATER PUMPING STATION
APSEY LAKE
LEGEND
S-31.3 - SAMPLING POINT SHOWING STREAM AND MILEAGE
ONTARIO WATER RESOURCES COMMISSION
TOWN OF ESPANOLA
WATER SUPPLY & WASTE WATER DISPOSAL
FIG. 6-6
SCALE : 1" = 2640'
DRAWN BY : O.F.
DATE : MAY 6 / 63
CHECKED BY : S.H
DRAWING NO : 63-163

buried river channel in the bedrock. However, the materials in the channel are relatively impervious silt and clay and the drilling contractor concluded that a municipal ground-water supply could not be developed within an economical distance of the town.

In Hallam Township near Lee Valley 32 feet of water-bearing gravel and boulders are found below a thick layer of clay in a buried river channel. This occurrence indicates that deposits of gravel can be expected at other locations along the old river channels. It is not known how close to Espanola such deposits occur.

III WATER POLLUTION

1. Sanitary Waste Disposal

The sewered area is shown on Figure 6-6. The north end of the municipality has a combined sewer system discharging to a 300 U.S. gpm capacity pumping station which is provided with an emergency overflow to the Spanish River.

The south-end of town has a separate sewer system. The sanitary sewage discharges to a pumping station with a rated capacity of 330 U.S. gpm which has an emergency overflow to Black Creek.

Both pumping stations discharge to a primary treatment plant, designed for 8,000 persons. To date, there has not been sufficient data accumulated to determine the efficiencies of this plant.

2. Industrial Waste Disposal

The KVP Company Limited operates an integrated Kraft and groundwood pulp and paper mill at Espanola, employing approximately 930 persons and producing approximately 325 tons of product per day.

Operations are fairly continuous in Kraft pulp production while the paper machines operate three to five days per week, depending on sales demand.

All process wastes except those from groundwood production, are discharged to a small lagoon adjacent to the mill, and thence, by submerged outfall to the Spanish River. Groundwood wastes are discharged directly to the river just downstream from the mill.

Waste disposal from this mill has been a matter of concern for a number of years. In-plant controls have been effective in eliminating gross pollution and accidental spills of chemical wastes, although some waste components that are characteristic of the Kraft pulping industry continue to affect the river. Studies are continuing into methods of controlling wastes that give rise to taste and odour in the river water, and will be the subject of a detailed report later this year.

3. Surface Water Quality

The results of the analyses of samples of the Spanish River within eight miles of Espanola are recorded in Table 6-10.

TABLE 6 - 10

VICINITY OF ESPANOLA - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | pH AT LAB. | IRON AS Fe (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|
| S 38.4 | SPANISH R. AT HWY.# 17 BRIDGE | SEPT. 29/60 | 1.7 | 26 | | | | | | 70 |
| | | JUNE 3/63 | 1.0 | 44 | | | 6.8 | 0.25 | | 24 |
| S 31.0 (NORTH) | SPANISH R. AT ESPANOLA BRIDGE | SEPT. 29/60 | 1.5 | 30 | | | | | 1 | 90 |
| | | JUNE 3/63 | 1.5 | 66 | | | | | 2.5 | 5,300 |
| S 31.0 (SOUTH) | SPANISH R. AT ESPANOLA BRIDGE | SEPT. 29/60 | 6.4 | 66 | 8 | 56 | | | | |
| | | JUNE 3/63 | 5.7 | 136 | | | | | 7.0 | 217,000 |

TABLE 6 - 10 CONT'D.

VICINITY OF ESPANOLA - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | PH AT LAB. | IRON AS Fe (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|
| S 25.8 | SPANISH R. AT WEBBWOOD BRIDGE | SEPT. 29/60 | 2.6 | 44 | | | | | 2 | 570 |
| | | OCT. 4/60 | 2.4 | 62 | | | 7.7 | 0.0 | 4 | 1,600 |
| | | JUNE 3/63 | 1.8 | 110 | | | 7.6 | 0.32 | 2.9 | 70 |

It is noted that the 5-day BOD and the coliform density of the water is increased considerably downstream from Espanola as compared with the upstream samples at the Highway #17 bridge. At the Espanola bridge, particularly on the south side of the Spanish River, the sample results do not meet OWRC objectives for stream sanitation which include a maximum of 4 ppm. for BOD and 2,400 coliforms per 100 ml.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations at this time.

## TOWN OF LEVACK

I GENERAL

The Town of Levack is located north-west of the City of Sudbury within the Township of Levack, adjacent to the Onaping Improvement District. The community started as an International Nickel Mine Company townsite and was incorporated as a town on January 1, 1939. The majority of the residents are employed at the Levack Mine and Mill operated by INCO.

The 1962 population was 3,122.

## II WATER SUPPLY

### 1. Sources

Water is obtained from Clear Lake and from three drilled wells which supply water for the Levack Mine and Mill as well as for domestic consumption.

### 2. Treatment and Water Quality

The three well pumps are rated at 1,116 gpm, 265 gpm, and 325 gpm. Treatment consists of gas chlorination. A pH problem on two of the wells is controlled by feeding a solution of soda ash and Alchem 918.

The chemical quality of the water is indicated by the following results of samples taken on April 4, 1963:

TABLE 6 - 11

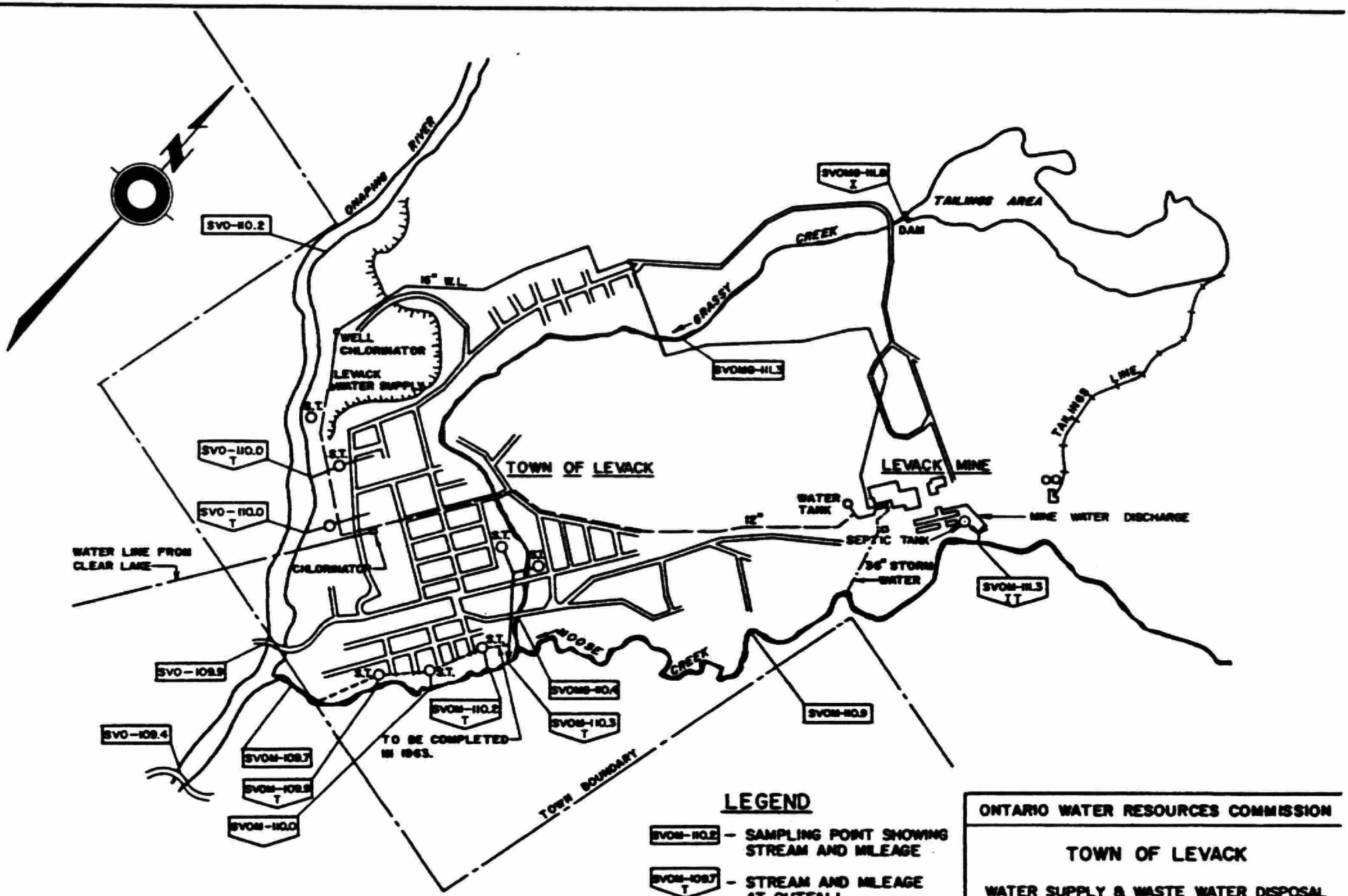
TOWN OF LEVACK - WATER SUPPLY - CHEMICAL QUALITY

| LOCATION | HARDNESS AS CaCO3 (PPM) | ALKALINITY AS CaCO3 (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | pH AT LAB. | COLOUR IN HAZEN UNITS | TURBIDITY IN SILICA UNITS |
|---|---|---|---|---|---|---|---|
| CLEAR L. | 22 | 8 | .22 | 4 | 6.5 | > 5 | 0.5 |
| WELL #1 | 278 | 18 | .08 | 13 | 6.1 | > 5 | 0.5 |
| WELL #3 | 210 | 30 | .05 | 11 | 6.4 | > 5 | 0.5 |

The chemical analyses reveal that a hard water is obtained from the wells whereas the lake supply is quite soft. Bacteriological examinations of samples taken of the treated water during the past year have been satisfactory.

### 3. Distribution

The water supply and feeder mains serving the town are owned and


GNAPHIM RIVER
SVO-110.2
16" W.L.
WELL CHLORINATOR
LEVACK WATER SUPPLY
S.T.
SVO-110.0 T
SVO-110.0 T
WATER LINE FROM CLEAR LAKE
CHLORINATOR
TOWN OF LEVACK
SVOM9-110.8 I
TAILINGS AREA
DAM
CREEK
GRASSY
SVOM9-110.3
TAILINGS LINE
LEVACK MINE
WATER TANK
12"
SEPTIC TANK
MINE WATER DISCHARGE
36" STORM WATER
SVOM-110.3 I T
SVO-109.8
SVO-109.4
SVOM-109.7
SVOM-109.2 T
SVOM-110.0
SVOM-110.2 T
TO BE COMPLETED IN 1963.
SVOM9-110.4
SVOM-110.3 T
MOOSE CREEK
SVOM-110.9
TOWN BOUNDARY
LEGEND
SVOM-110.2 – SAMPLING POINT SHOWING STREAM AND MILEAGE
SVOM-109.7 T – STREAM AND MILEAGE AT OUTFALL
– TYPE OF OUTFALL
T - S.T.P. EFFLUENT
I - INDUSTRIAL
S - UNTREATED SEWAGE
ONTARIO WATER RESOURCES COMMISSION
TOWN OF LEVACK
WATER SUPPLY & WASTE WATER DISPOSAL
FIG. 6-7
SCALE: 1" = 1,320'
DRAWN BY: A.R.S.
DATE: MAY, 1963
CHECKED BY:
DRAWING N°: 63-168

maintained by INCO. The distribution mains are owned and maintained by the town.

The essential features of the water works system are outlined on Figure 6-7. Storage is provided by a 158,000-gallon elevated tank at the Levack Mine. Water is distributed to 650 to 700 homes and businesses.

4. Water Requirements for the Future

Since 1941 Levack has had a variable growth pattern, marked by decreases during several years. Town officials state that they do not anticipate marked growth in the future.

The present water supplies appear to be quite adequate for the future.

5. Potential Additional Water Supplies

Sand and gravel deposits which border the east bank of the Onaping River should yield water in large, additional quantities.

Above Levack, the Onaping River has a satisfactory chemical and bacterial quality. Low alkalinity characteristics suggest that any supply derived therefrom might be corrosive.

III WATER POLLUTION

1. Sanitary Waste Disposal

Sanitary sewage is collected by separate systems of sanitary sewers which convey the flow to twelve communal septic tanks and leaching pits. Refer to Figure 6-7. The systems are over-loaded and consequently impose excessive organic and bacterial loadings on the watercourses. Sanitary chemical analyses from eight of these outlets are given in Table 6-12.

TABLE 6 - 12

VICINITY OF LEVACK - STREAM AND OUTFALL SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | PH AT LAB. | COPPER AS Cu (PPM) | NICKEL AS Ni (PPM) | IRON AS Fe (PPM) | M.F. COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SVO 109.4 | ONAPING R. AT ROAD TO FECUNIS MINE | JUNE 27/60 | 0.7 | 54 | 8 | 46 | | | | | 1,000 |
| | | OCT. 18/60 | 4.8 | 100 | | | | | | | 570 |
| | | AUG. 16/61 | 1.0 | 84 | | | | 0.2 | 0.0 | 0.68 | 9 |
| | | JUNE 3/63 | 1.4 | 78 | | | | | | | 5,300 |
| SVO 109.8 | ONAPING R. AT HWY. #544 | MAY 29/59 | 1.1 | 42 | 8 | 34 | | | | | |
| | | OCT. 6/62 | 1.1 | 42 | | | | 0.04 | 0.0 | 0.44 | 7,150 |
| | | JUNE 3/63 | 1.1 | 80 | | | | | | | 11,000 |
| SVO 110.0T | SEPTIC TANK EFFLUENT TO ONAPING R. | MAY 28/59 | 144 | 464 | 84 | 380 | | | | | 10,000,000 |
| | | JUNE 27/60 | OUTLET SUBMERGED | | | | | | | | |
| | | OCT. 18/61 | 240 | 420 | 164 | 256 | | | | | 26,000,000 |
| SVO 110.0T | SEPTIC TANK EFFLUENT TO ONAPING R. | MAY 28/59 | 213 | 566 | 112 | 454 | | | | | 10,000,000 |
| | | JUNE 27/60 | 170 | 656 | 135 | 520 | | | | | 10,000,000 |
| | | OCT. 18/61 | 220 | 452 | 142 | 310 | | | | | 16,000,000 |
| SVO 110.2 | ONAPING R. ABOVE TOWN | MAY 29/59 | 1.2 | 40 | 2 | 38 | | | | | 10 |
| | | JUNE 27/60 | 1.0 | 54 | 10 | 44 | | | | | - |
| | | OCT. 18/60 | 2.2 | 40 | | | | | | | 63 |
| | | AUG. 16/61 | 1.0 | 48 | | | | | | | 106 |
| | | JUNE 3/63 | 1.5 | 44 | | | | | | | 124 |
| SVOM 109.7 | MOOSE CREEK JUST ABOVE CONFLUENCE | JUNE 27/60 | 1.6 | 484 | 38 | 446 | | | | | 1,000 |
| | | OCT. 18/60 | 15. | 816 | | | | | | | 3,200 |
| | | AUG. 16/61 | 4.0 | 402 | | | | 0.72 | 7.0 | 2.8 | 0 |
| | | NOV. 5/62 | 8.0 | 932 | | | | | | | 50 |
| | | NOV. 8/62 | 12.0 | 768 | | | 3.5 | | 13.3 | 2.8 | 270 |
| | | JUNE 3/63 | 4.4 | 992 | | | | | | | 600 |
| SVOM 109.9T | SEPTIC TANK OUTFALL TO MOOSE CR. | MAY 28/59 | 144 | 550 | 118 | 432 | | | | | 10,000,000 |
| | | JUNE 27/60 | 235 | 512 | 76 | 436 | | | | | 10,000,000 |
| | | OCT. 18/61 | 68 | 122 | 22 | 100 | | | | | 1,300,000 |
| SVOM 110.0T | SEPTIC TANK OUTFALL TO MOOSE CR. | MAY 28/59 | 308 | 572 | 108 | 464 | | | | | 10,000,000 |
| | | JUNE 27/60 | 105 | 460 | 54 | 406 | | | | | 10,000,000 |
| | | OCT. 18/61 | 155 | 306 | 102 | 204 | | | | | 2,000,000 |

TABLE 6 - 12 CONT'D.

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | pH AT LAB. | COPPER AS Cu (PPM) | NICKEL AS Ni (PPM) | IRON AS Fe (PPM) | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SVOM110.2T | SEPTIC TANK OUTFALL TO MOOSE CR. | MAY 28/59 | 128 | 410 | 56 | 354 | | | | | 1,000,000 |
| | | JUNE 27/60 | 140 | 406 | 44 | 362 | | | | | 10,000,000 |
| | | OCT. 18/61 | 59 | 146 | 26 | 120 | | | | | 15,000 |
| SVOM110.3T | TRUNK SEWER OUTFALL TO MOOSE CR. AT GRASSY CR. JUNCTION | JUNE 4/63 | 190 | 576 | 85 | 491 | | | | | 99,000,000 |

A report by the consulting engineering firm of Proctor & Redfern, March 1962, recommends a staged plan for the installation of collector sewers and sewage treatment facilities. The town has adopted the plan and in 1962 a trunk sewer was constructed to intercept the two outlets discharging to Grassy Creek and drain to Moose Creek. In 1963 a trunk sewer will be constructed parallel to Moose Creek to collect all sanitary outlets in this area. This trunk will temporarily discharge to the Moose Creek, but in 1964 it will be extended parallel to the Onaping River to collect the remaining outlets. Although a decision as to the type of treatment to be provided has not been made, installation of the treatment facilities is scheduled for 1964.

All sanitary waste from the Levack Mine and Mill is presently discharged to a large two-compartment septic tank. The outlet from the tank enters a concrete tunnel where it mixes with the mine water discharge. The combined effluent enters Moose Creek at a point immediately adjacent to the septic tank. The staged program included the sanitary waste water from the mine and mill to be directed to the town sewers. This work is to follow the construction of the treatment facilities.

2. Industrial Waste Disposal

In the Town of Levack, International Nickel Company owns and operates the Levack mine and concentrator. The two operations employ approximately 2,060 persons. All mine water consisting of seepage and water which has been supplied from the surface system is discharged to Moose Creek.

This waste flow, measured at 400 gpm, includes the water used to transport sand underground as fill(175 gpm). Tailings from the concentrator are discharged by pipe line to Mud Lake located north of the mine. The tailings are transported hydraulically in a flow of approximately 645 gpm. The discharge from the tailings area is directed to Grassy Creek.

3. Surface Water Quality

The sample analyses results are recorded in Table 6-12. There were eight outfalls located in the Town of Levack. Six of these discharge from community septic tanks. The mine tailings area discharges to Grassy Creek and the mine water and septic tank effluent discharges to Moose Creek. The results indicate that an excessive bacterial and organic loading is being imposed on the watercourses. Sample point SVOM 109.7, the discharge point of Moose Creek to the Onaping River reveals BOD values in excess of the OWRC objective of 4 ppm., a depressed pH, and significant concentrations of nickel and iron.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

Ground water should receive first consideration for the development of additional water supplies as fluctuations in quality during the year are minor.

V RECOMMENDATIONS FOR POLLUTION CONTROL

The staged program outlined in the Proctor & Redfern report should be pursued with the objective of eliminating polluting waste discharges to Moose Creek and Onaping River.

# TOWN OF LIVELY

## I GENERAL

Lively was erected by INCO about ten miles west of the City of Sudbury as a residential town. The present population is 3,250. The company owns and operates the water distribution and treatment works and sewage collection and disposal facilities.

## II WATER SUPPLY

### 1. Source

Water is obtained from Meatbird Lake.

### 2. Treatment Works and Water Quality

The pump capacity is 500 U.S. gpm. Two 1200 gpm standby pumps are also provided.

The chemical quality of the raw water is indicated by the following average results of the chemical analyses of samples taken monthly during the past year.

TABLE 6 - 13

TOWN OF LIVELY - WATER SUPPLY - CHEMICAL QUALITY

| HARDNESS AS CaCO3 (PPM) | ALKALINITY AS CaCO3 (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | FLUORIDE AS F (PPM) | pH AT LAB. | COLOUR IN HAZEN UNITS | TURBIDITY IN SILICA UNITS |
|---|---|---|---|---|---|---|---|
| 170 | 9 | 0.59 | 9 | 0.3 | 5.1 | > 5 | 2.6 |

The raw water exhibits a depressed pH and an iron concentration above the recommended limit. Treatment consists of chlorination and the addition of a mixture of soda ash and Alchem 918 for pH control.

During the past year the raw water exhibited bacterial contents from 0 to 19 coliforms per 100 ml. The treated water was bacteriologically satisfactory.

The average and maximum daily consumptions are estimated to be 125,000 gallons and 200,000 gallons respectively.

3. Distribution

The water area is outlined on Figure 6-8. A 208,000-gallon standpipe is provided and there are approximately 700 services.

4. Water Requirements for the Future

The existing system is adequate to meet the present demand and, based on the population trends, the water demand in 1980 will not be substantially greater than at present.

5. Potential Additional Water Supplies

No records are on file for water wells drilled in the Town of Lively. The local topography suggests that water-bearing sands and gravel may be present at depths below the broad valley on which the town is built. A limited program of test-drilling would be needed to test this deduction.

III WATER POLLUTION

1. Waste Disposal

(a) Existing Conditions

The sanitary sewer system, which is outlined on Figure 6-8, is divided into two sections; namely east and west. Each section discharges to a septic tank and each septic tank discharges to three leaching pits arranged in series. The effluents discharge to a tributary of Meatbird Creek.

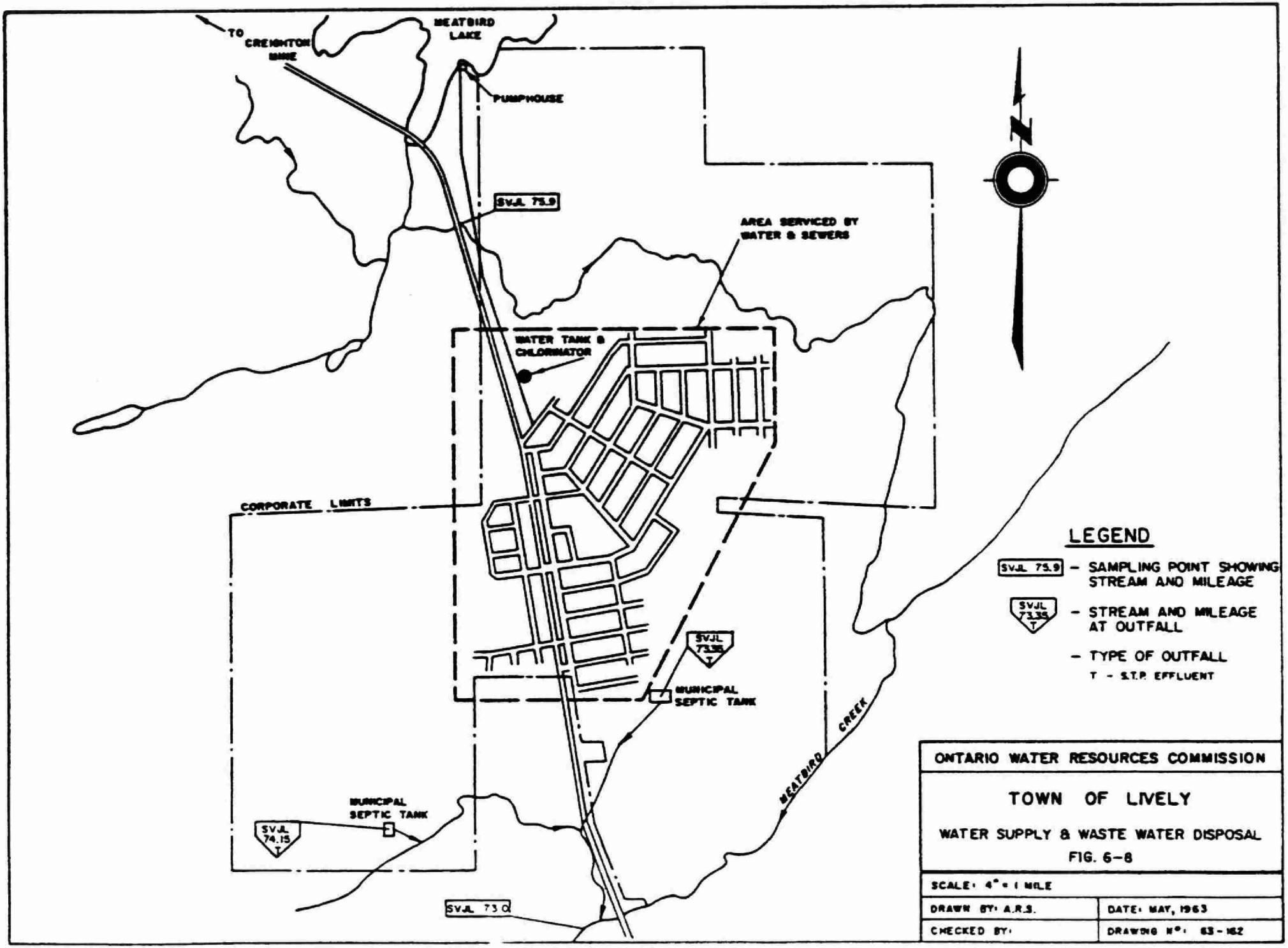

TO CREIGHTON MINE
MEATBIRD LAKE
PUMPHOUSE
SVJL 75.9
AREA SERVICED BY WATER & SEWERS
WATER TANK & CHLORINATOR
CORPORATE LIMITS
SVJL 73.35 T
MUNICIPAL SEPTIC TANK
MEATBIRD CREEK
MUNICIPAL SEPTIC TANK
SVJL 74.15 T
SVJL 73.0
N
LEGEND
SVJL 75.9 – SAMPLING POINT SHOWING STREAM AND MILEAGE
SVJL 73.35 T – STREAM AND MILEAGE AT OUTFALL
– TYPE OF OUTFALL
T - S.T.P. EFFLUENT
ONTARIO WATER RESOURCES COMMISSION
TOWN OF LIVELY
WATER SUPPLY & WASTE WATER DISPOSAL
FIG. 6-8
SCALE: 4" = 1 MILE
DRAWN BY: A.R.S.
DATE: MAY, 1963
CHECKED BY:
DRAWING N°: 63-162

TABLE 6 - 14

TOWN OF LIVELY - STREAM AND OUTFALL SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | TURBIDITY IN SILICA UNITS | pH AT LAB. | IRON AS Fe (PPM) | COPPER AS Cu (PPM) | NICKEL AS Ni (PPM) | M.F. COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SVJL 71.9 | MEATBIRD CREEK AT HWY. 17 | AUG. 16/61 | 4.6 | 502 | | | 2 | 6.9 | | | | 10 |
| | | AUG. 1/62 | 1.2 | 732 | | | 29 | 5.7 | | | | 18,600 |
| | | JUNE 3/63 | 1.6 | 532 | | | 5 | | | | | 160 |
| SVJL 73.0 | MEATBIRD CREEK AT SIDEROAD BELOW LIVELY | JULY 27/60 | 6.4 | | | | 7 | | | | | 37,000 |
| | | OCT. 5/60 | 8.0 | 542 | | | 6 | | | | | 16,000 |
| | | AUG. 16/61 | 2.2 | 620 | 44 | 576 | | 6.7 | .8 | .52 | 2.6 | 30 |
| | | AUG. 1/62 | 1.5 | 730 | | | 3.3 | 6.4 | | | | 2,100 |
| | | JUNE 3/63 | 2.6 | 562 | | | 24. | 6.6 | 1.32 | .75 | 6.5 | |
| SVJL 73.35T | LIVELY EAST SIDE SEPTIC TANK EFFLUENT | JUNE 3/63 | 230. | 722 | 120 | 602 | | | | | | |
| SVJL 74.15T | LIVELY WEST SIDE SEPTIC TANK EFFLUENT | JUNE 3/63 | 120. | 584 | 83 | 501 | | | | | | |
| SVJL 75.9 | MEATBIRD CREEK AT HWY. 535 ABOVE LIVELY | OCT. 5/60 | 1.0 | 780 | | | 2 | | | | | 26 |
| | | AUG. 16/61 | 1.6 | 750 | 54 | 696 | | 4.0 | 5.0 | 1.44 | 16.2 | 0 |
| | | AUG. 1/62 | 0.8 | 1088 | | | 12. | 4.1 | 1.09 | | 46. | 28 |
| | | JUNE 3/63 | 0.7 | 766 | | | 3.3 | 4.2 | 0 | 1.4 | 25. | |

The treatment provided is not adequate and excessive concentrations of BOD, suspended solids, and high bacterial concentrations are discharged to the receiving stream as indicated by the laboratory results listed in Table 6-14.

(b) Proposed Sewage Works

Preliminary plans have recently been submitted to the OWRC by INCO on behalf of Lively, for a sewage works project including trunk sanitary sewers, a sewage pumping station and an extended aeration-type sewage treatment plant.

2. Surface Water Quality

Reference should be made to the results listed in Table 6-14. The effluents discharged from the two septic tanks have an adverse effect on the quality of Meatbird Creek. Concentrations above the OWRC objectives of 4 ppm. BOD and 2,400 coliforms per 100 ml. have been recorded in Meatbird Creek downstream of Lively.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations in this respect at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

Adequate sewage treatment should be provided.

## TOWN OF MASSEY

I GENERAL

Massey is a residential town with a population of approximately 1,260 located at the south-west corner of the Sudbury District north of the Spanish River and immediately east of the Sauble River.

## II WATER SUPPLY

### 1. Source

Massey obtains water from the Sauble River.

### 2. Treatment Works and Water Quality

Water flows by gravity from the river to a 250 gpm pump which discharges to the distribution system.

Treatment consists of gas chlorination.

The chemical quality of the water is indicated by the following results of a chemical analysis of a sample taken at the pump on June 6, 1963:

TABLE 6 -15

TOWN OF MASSEY - WATER SUPPLY - CHEMICAL QUALITY

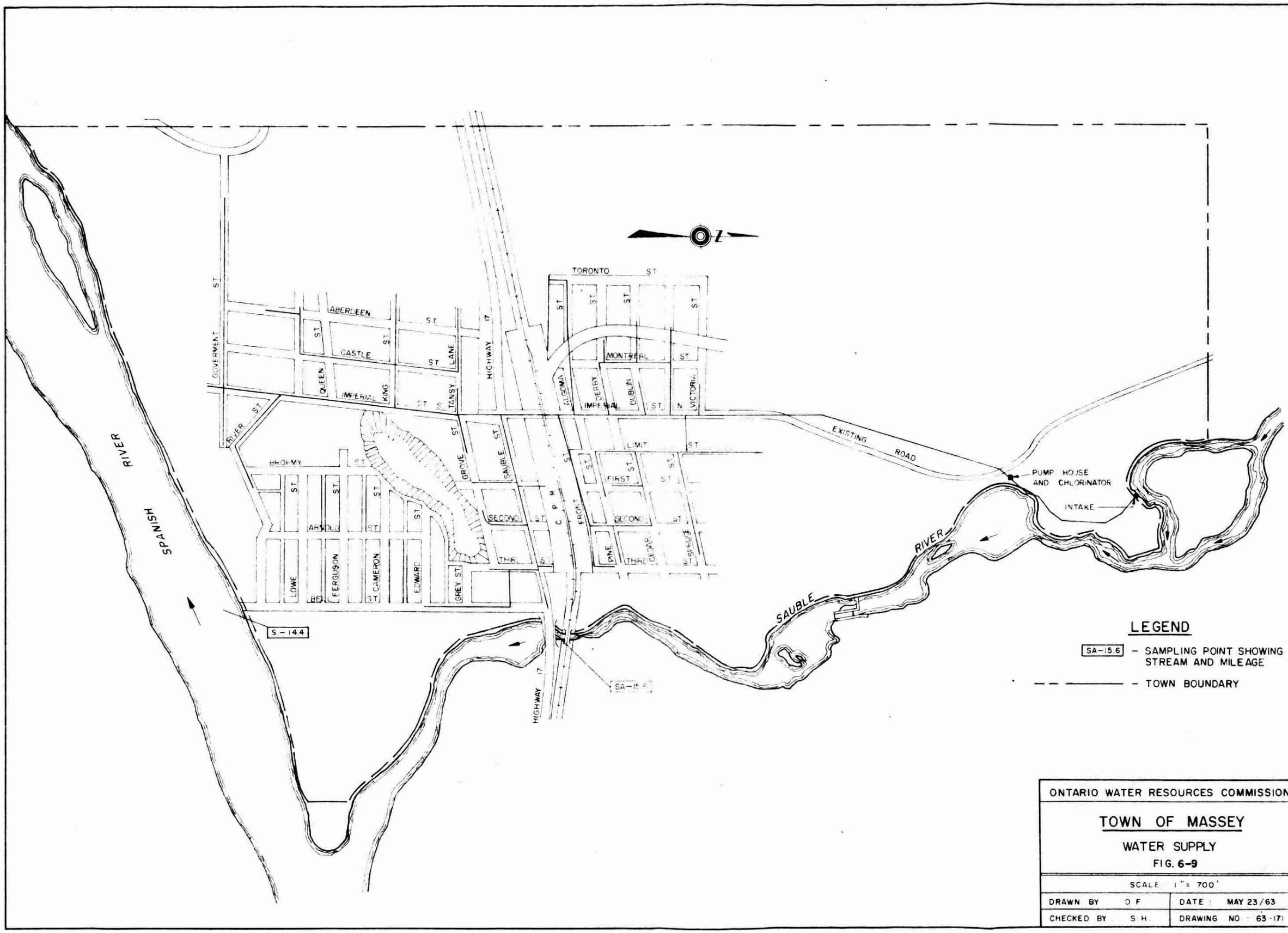
| HARDNESS AS CaCO3 (ppm) | ALKALINITY AS CaCO3 (ppm) | IRON AS Fe (ppm) | CHLORIDE AS Cl (ppm) | pH AT LAB. | COLOUR IN HAZEN UNITS | TURBIDITY IN SILICA UNITS |
|---|---|---|---|---|---|---|
| 16 | 8 | 0.26 | 3 | 7.5 | 15 | 1.1 |

The water is quite soft and has aggressive tendencies.

The raw water contained bacterial contents ranging from 34 to 930 coliforms per 100 ml. during the past years. The bacteriological quality of the treated water was satisfactory.

### 3. Distribution

The distribution network is outlined on Figure 6-9. There are approximately 325 services.


N
TORONTO ST
ABERDEEN ST
CASTLE ST
QUEEN ST
IMPERIAL ST
KING ST
TANSY LANE
GOVERNMENT ST
HIGHWAY 17
ALGOMA ST
DERBY ST
DUBLIN ST
MONTREAL ST
VICTORIA ST
IMPERIAL ST
LIMIT ST
EXISTING ROAD
PUMP HOUSE AND CHLORINATOR
INTAKE
RIVER
SAUBLE
SPANISH
RIVER
RILEY ST
BROPHY ST
GROVE ST
SAUBLE ST
FIRST ST
SECOND ST
THIRD ST
FRONT ST
PINE ST
CEDAR ST
HIGHWAY 17
C P R
ARNOLD ST
LOWE ST
FERGUSON ST
CAMERON ST
EDWARD ST
GREY ST
S-144
SA-15.6
LEGEND
SA-15.6 - SAMPLING POINT SHOWING STREAM AND MILEAGE
- - ——— - TOWN BOUNDARY
ONTARIO WATER RESOURCES COMMISSION
TOWN OF MASSEY
WATER SUPPLY
FIG. 6-9
SCALE 1" = 700'
DRAWN BY O F
DATE : MAY 23/63
CHECKED BY S H.
DRAWING NO : 63-171

4. Water Requirements for the Future

Based on the population trend it is expected that the system will provide adequate capacity for the water demand in 1980. However, provision should be given to the installation of elevated storage for fire protection and pressure control.

The distribution system is in need of repair and replacement. In a report prepared in 1959, Lewis, Lane and Company Limited, Consulting Engineers, proposed improvements to the distribution system. These changes should be undertaken as the financial condition of the municipality permits the necessary expenditure.

5. Potential Additional Water Supplies

In the vicinity of Massey, sand and gravel deposits are fairly widespread on the west side of the Sauble River north of the cemetery. These sands and gravels have excellent potential for ground-water supplies. Mr.T.Crabs has a dug well two miles north of the town in gravels 500 feet west of the Sauble River, and reports that the well is sympathetic with the water level in the river. The analyses indicate that the water is soft and satisfactory in other respects.

Massey is built on a sand plain that extends south to the Spanish River. There is a possibility that coarser sand and gravel deposits occur below the sands near the town. Support for this idea is received in the only well record on file for Massey. Near the junction of Aberdeen Street and Government Road a two-inch diameter well cut coarse sand from 100 to 120 feet and gravel from 120 to

125 feet. The well provided a small supply of water. The possibility of an extensive sand and gravel aquifer below the sands at Massey could be evaluated by a test-drilling program based on a thorough examination of the glacial geology and topography.

## III WATER POLLUTION

### 1. Waste Disposal

There are no storm or sanitary sewers. Sewage disposal is effected by private septic tank systems and outdoor privies. The installation of these systems is supervised by the Sudbury and District Health Unit. The soil is sandy and the units function satisfactorily. No waste discharges were located.

### 2. Surface Water Quality

TABLE 6 - 16

VICINITY OF MASSEY - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | TURBIDITY IN SILICA | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|
| S 14.4 | SPANISH R. AT BRIDGE AT MASSEY | OCT. 4/60 | 4.0 | 82 | - | 5,700 |
| SA 15.6 | SAUBLE R. AT HWY.#17 | OCT. 4/60 | 3.2 | 44 | 2 | 69 |
| | | JUNE 3/63 | 1.2 | 36 | 1.1 | 45 |

The quality of the Sauble River water is satisfactory but the sample taken from the Spanish River contained coliform bacteria in excess of 2,400 coliforms per 100 ml.

## IV RECOMMENDATIONS FOR WATER DEVELOPMENT

It is recommended that consideration be given to the provision of a standpipe for storage and pressure control.

V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations in this respect at this time.

## TOWN OF WEBBWOOD

I GENERAL

Webbwood is a residential town with a population of approximately 520 located on Highway #17 at the south-west corner of the Sudbury District immediately north of the Spanish River. The residents are largely CPR employees and their families.

II WATER SUPPLY

1. Source

Water is obtained from private wells. In addition, some residences receive water from the spring-fed Lily Lake via a private system, owned by Mr.E.Grexton.

2. Treatment Works and Water Quality

The Lily Lake water is distributed by gravity flow and no treatment is provided. This water is not sold for potable purposes. The water quality is indicated by the following results of the analyses of samples taken at the Grexton residence on June 6, 1963.

TABLE 6 - 17

TOWN OF WEBBWOOD - WATER SUPPLY - CHEMICAL QUALITY

| HARDNESS AS CaCO3 (PPM) | ALKALINITY AS CaCO3 (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | pH AT LAB. | COLOUR IN HAZEN UNITS | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|
| 22 | 18 | 10.6 | 6 | 6.8 | 270 | 9.0 | 300 |

The water is very soft with a very high colour density and excessive iron content.

The private well supplies are reported to furnish water of satisfactory quality. However, there exists a possibility of contamination from individual sewage disposal units.

3. Distribution

The Lily Lake system supplies 11 residences and the CPR buildings. Distribution is shown on Figure 6-10. No storage facilities are provided although the lake may be considered as natural elevated storage.

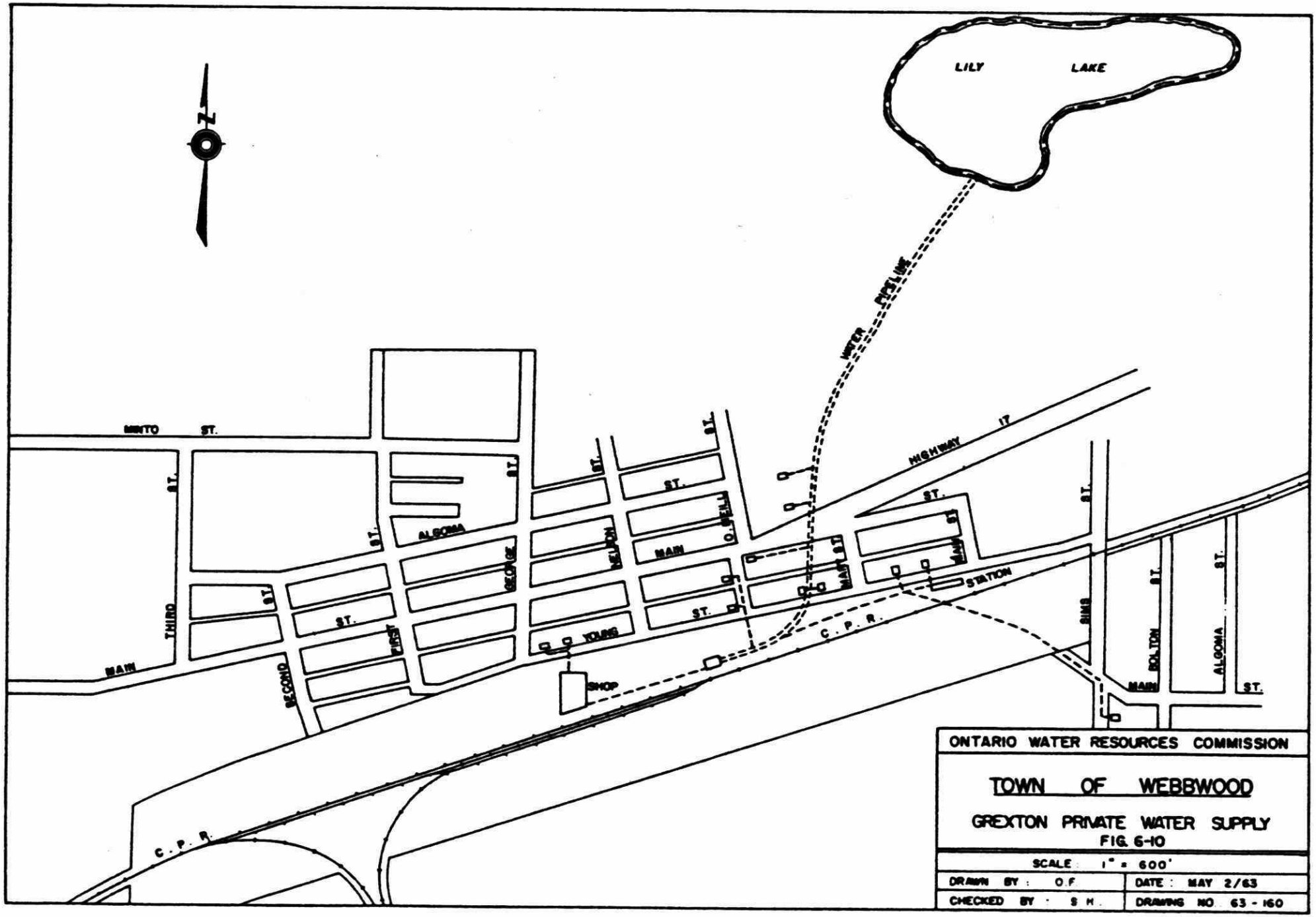
4. Water Requirements for the Future

A municipal water works is desirable. A report on a system employing a well supply was prepared in 1959 by E.M.Powell and Associates.

5. Potential Additional Water Supplies

Adequate water for private supplies is obtained from well points driven in the sand plain at Webbwood. However, it is unlikely that high capacity wells could be developed in the fine sands of the plain and no records are available for deep wells in the area.

The sand plain at Webbwood lies between high bedrock hills and appears to be a lake or river bottom deposit in a large pre-glacial valley. Varved clays are exposed below the sands in the Birch Creek Valley near the electric transmission line. It is possible that gravel is present in the deeper parts of the old river valley, and could supply adequate water for a municipal system. The presence or absence of gravels would have to be shown by a test-drilling program. Near Webbwood the more favourable area for the presence of gravels is in the east end of town toward the Spanish R.




ONTARIO WATER RESOURCES COMMISSION

# TOWN OF WEBBWOOD

## GREXTON PRIVATE WATER SUPPLY

FIG. 6-10

| | |
|---|---|
| SCALE : 1" = 600' | |
| DRAWN BY : O.F | DATE : MAY 2/63 |
| CHECKED BY : S.H. | DRAWING NO. 63 - 160 |

North of Webbwood at the community of Shakespeare, sand and gravel deposits are present in the valley followed by the road to Agnew Lake. The gravel deposits near the sand plain possess good possibilities for sizeable ground-water supplies, but they are about 3-1/2 miles from the town.

Lily Lake and the Spanish River have sufficient capacity for a municipal supply. However, the Spanish River near Webbwood is downstream from the paper mill at Espanola and the Lily Lake water has high colour density and iron content. The capacity of Birch Creek for a municipal supply is doubtful. Birch Creek water is soft with a high colour density but otherwise it is generally satisfactory.

## III WATER POLLUTION

### 1. Sanitary Waste Disposal

Sewage disposal facilities include private septic tank and tile bed systems, septic tank and cesspools, cesspools only and some pit privies. The installation of these systems is supervised by the Sudbury and District Health Unit. No outfalls were located discharging to local watercourses.

## IV RECOMMENDATIONS FOR WATER DEVELOPMENT

A municipal water works should be constructed, preferably with ground-water supply. Ground water potential could be determined by a test-drilling program. If ground water is found to be inadequate then a surface supply could be used after proper treatment.

## V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations in this respect at this time.

# CHAPTER SEVEN

## TOWNSHIPS (ORGANIZED)

### TOWNSHIP OF BALDWIN



### TOWNSHIP OF BALFOUR



### TOWNSHIP OF BLEZARD

## TOWNSHIP OF CAPREOL



## TOWNSHIPS OF CASIMIR, JENNINGS & APPLEBY



## TOWNSHIP OF CHAPLEAU

PAGE No.

TOWNSHIPS OF COSBY, MASON & MARTLAND



TOWNSHIP OF DOWLING



TOWNSHIPS OF DRURY, DENISON & GRAHAM

TOWNSHIP OF FALCONBRIDGE



TOWNSHIP OF HAGAR



TOWNSHIP OF HALLAM

TOWNSHIP OF HANMER — PAGE NO.



TOWNSHIP OF NAIRN



TOWNSHIPS OF NEELON & GARSON

## TOWNSHIPS OF RATTER & DUNNET



## TOWNSHIP OF RAYSIDE



## TOWNSHIPS OF SALTER, MAY & HARROW

TOWNSHIP OF WATERS

# CHAPTER 7 - TOWNSHIPS (ORGANIZED)

## TOWNSHIP OF BALDWIN

### I GENERAL

The Township of Baldwin is bisected by Highway #17 and is situated directly north of the Town of Espanola. There are no industries located within the municipality and the only community is McKerrow which is situated on Highway #17 immediately east of the Espanola Road. The 1963 population is 500.

### II WATER SUPPLY

In general, residents obtain water from private wells. No major water requirements are foreseen for the future.

Potential Additional Water Sources

Gravels are present locally at a depth below the plains at McKerrow and are found on the surface in kame-like deposits in Concession IV, Lot 7. The gravels provide favourable conditions for the occurrence of ground water.

The only surface water source in Baldwin Township is Spanish Lake, an enlargement of the Spanish River. As this lake is situated in the northern section of the township at a considerable distance from any development, it is unlikely that it would be utilized as a surface water source in the foreseeable future.

### III WATER POLLUTION

Domestic sewage is disposed of by private septic tank systems or outdoor privies. Septic tank and tile bed installations are supervised by the Sudbury and District Health Unit.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations at this time.

## TOWNSHIP OF BALFOUR

I GENERAL

Balfour Township is located north-west of the City of Sudbury on the Vermilion River and Whitson River Watersheds. Ribbon development is occurring along Highway #544, in the neighbourhood of Chelmsford, and to a lesser degree along the township roads. The 1963 assessed population is 2,037. No industrial operations presently exist in the township.

II WATER SUPPLY

In most cases water is obtained from private shallow wells. A few homes are supplied from deeper drilled wells.

A private water supply system owned by Falconbridge Nickel Mines Ltd. draws water from the Vermilion River and supplies twenty-two homes located in a company-owned subdivision in the south-western corner of the township. Chlorination constitutes the only form of treatment.

The present private water systems should be adequate for the forseeable future as no large population expansion in the township is anticipated.

Potential Additional Water Supplies

The available information offers little encouragement for large,

ground-water supplies within the Township of Balfour.

Potential surface water sources are Whitson Creek and the Onaping and Vermilion Rivers.

Both the Vermilion River and the Whitson River flow through the Township of Balfour. Samples taken from the Vermilion River in the township were found to be of satisfactory chemical and bacteriological quality. Samples taken from the Whitson River before it enters the township and above the Town of Chelmsford were found to be satisfactory, but a sample taken below Chelmsford was found to have a coliform count in excess of the accepted standard.

Both the Vermilion River and Whitson Creek flow through the township and past analyses indicate a satisfactory chemical quality for domestic water supply.

III WATER POLLUTION

Private septic tanks or outdoor privies are employed for domestic waste disposal. The installation of septic tank systems is supervised by the Sudbury and District Health Unit. The effluent from the Chelmsford sewage lagoon is discharged to McKenzie Creek. The lagoon effluent has generally been of satisfactory quality.

The results of samples collected are tabulated in Table 7-1. The sanitary chemical and bacterial quality of the Vermilion River appears satisfactory. A high iron content was noted in the analysis of a sample taken on August 16, 1961 from the Onaping River upstream from the junction with the Vermilion River. The Whitson River above Chelmsford was chemically and bacteriologically satisfactory.

TABLE 7 - 1

TOWNSHIP OF BALFOUR - STREAM AND OUTFALL SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE | 5-DAY BOD (PPM) | SOLIDS TOTAL (PPM) | SOLIDS SUSP. (PPM) | SOLIDS DISS. (PPM) | PH AT LAB. | COPPER AS Cu | NICKEL AS Ni | IRON AS Fe (PPM) | TURBIDITY IN SILICA UNITS | M.F. COLIFORM COUNT PER 100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SV0 99.9 | ONAPING RIVER AT HIGHWAY WEST OF JUNCTION | OCT. 3/60 | 1.7 | 116 | | | 7.1 | | | | 2 | 31 |
| | | AUG. 16/61 | 1.0 | 82 | | | | 0.08 | 0.0 | 0.64 | 1 | 16 |
| | | JUNE 3/63 | 1.2 | 76 | | | | | | | 0.8 | 1,100 |
| SV 97.0 | VERMILION RIVER AT HIGHWAY BRIDGE 1½ MILES NORTH OF LARCHWOOD | OCT. 3/60 | 1.7 | 102 | | | 7.3 | | | | 2. | 28 |
| | | AUG. 16/61 | 0.9 | 62 | | | 0 | | | | 1. | 8 |
| | | JUNE 3/63 | 1.1 | 72 | | | | | | | 1.1 | 258 |
| SVH 89.3 | WHITSON RIVER ABOVE CHELMSFORD | OCT. 3/60 | 1.6 | 164 | | | 7.8 | | | | 3. | 31 |
| | | OCT. 20/60 | | | | | 7.0 | | 0.7 | | 2. | 40 |
| | | AUG. 16/61 | 1.0 | 144 | | | | | | | 2. | 30 |
| | | JUNE 3/63 | 1.6 | 176 | | | | | | | 2.1 | 58 |
| SVH 86.3 | WHITSON RIVER BELOW CHELMSFORD AT HIGHWAY 544 | OCT. 3/60 | 2.6 | 186 | | | 7.7 | | | | 3. | 4,700 |
| | | AUG. 16/61 | 1.3 | 148 | | | | | | | 1. | 9 |
| | | JUNE 3/63 | 1.2 | 204 | | | | | | | 1.8 | 2,700 |
| SVK 87.3 | MCKENZIE CREEK 100 FT. ABOVE CHELMSFORD LAGOON EFFLUENT | JUNE 4/63 | 1.0 | 98 | 2 | 96 | | | | | | 28 |
| SVK 87.3T | CHELMSFORD LAGOON EFFLUENT | JUNE 4/63 | 44.0 | 420 | 112 | 308 | | | | | | 300 |
| SVK 87.3 | MCKENZIE CREEK 100 FT. BELOW CHELMSFORD LAGOON EFFLUENT | JUNE 4/63 | 4.0 | 138 | 12 | 126 | | | | | | 76 |

However, downstream from Chelmsford the bacterial concentration is raised above the maximum recommended limit of 2,400 coliform organisms per 100 ml. The results of chemical analyses of samples from McKenzie Creek indicate that, at the present time, conditions are satisfactory.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations at this time.

## TOWNSHIP OF BLEZARD

I GENERAL

Blezard Township is located immediately north of, and bordering on, the City of Sudbury. The northern portion, in the valley of the Whitson River, contains considerable farm land, while the southern part consists of rough hills. The population of the area has expanded rapidly since 1950 with the overflow of population from Sudbury settling in the Val Caron, Blezard Valley and Guilletville(McCrea) areas. The 1963 assessed population is 5,038.

Approximately one-half of the township is owned by mining companies but no industrial operations are presently carried out. Some agricultural activity exists in Whitson Valley but most of the residents commute to the Sudbury mining areas for their livelihood. The main population centre is Val Caron which is situated at the intersection of Hwys. #69 and #634.

II WATER SUPPLY

Practically all residents in the township obtain water from private shallow wells which generally provide water which is coloured, and has disagreeable tastes and odours. A water supply system would be desirable to serve the community of Val Caron. It should be of sufficient capacity to provide for extension to serve the Blezard Valley and McCrea Subdivision areas.

Potential Additional Water Supplies

An engineering report by Dillon and Lewis Ltd., Consulting Engineers, was prepared in 1962, concerning the possibilities of providing water and sewage works for Val Caron. The report recommended the use of Whitson Lake as a source of supply for a water area to be established along Hwy.#69, from Whitson Lake to the Township of Hanmer(total serviced population 2,500). The proposed supply would provide for the extension of the system to serve the estimated 10,000 persons expected in the Val Caron area by 1972. Chlorination was the only form of treatment suggested. International Nickel Co.of Canada Ltd., which presently obtains water from Whitson Lake has indicated that without extensive revision to the present intakes and control dam, it will not be possible for the township to obtain the required 1.0 mgd in addition to the company's present consumption during a year of low water levels.

The presence of a small sand deposit in Concession VI, Lot 3, suggests that the sand and gravel outwash deposits of Hanmer and Capreol Townships may extend south into Blezard Township. In a

recent ground-water survey report prepared by this Commission, it was recommended that, if Blezard Township did not enter into a joint water scheme with the Townships of Capreol and Hanmer, a test-drilling program to seek favourable aquifer conditions for the construction of high capacity wells should be carried out starting in the vicinity of Val Caron and moving to the north-east. There is also the possibility that a battery of sandpoints, situated in an area protected against contamination, would be able to supply large quantities of water for the built-up areas of the township.

Several good capacity rock wells near Highway #69 in Concessions III to V indicate possible sites for rock wells if the chemical quality of the water is satisfactory.

Both Whitson Lake and Whitson River provide sources of potential surface water supply.

## III WATER POLLUTION

### 1. Sanitary Waste Disposal

#### (a) Existing Conditions

There are no sewage collection systems in Blezard Township at the present time. All domestic sewage is disposed of in private septic tank installations supervised by Sudbury and District Health Unit. Septic tank systems do not function satisfactorily in the valley area since the water table is relatively high, particularly during the spring run-off and following heavy rains. Malfunctioning septic tank systems have indicated the need for a sewerage system to serve the populated areas.

(b) Proposed Sewage Works

The engineering report by Dillon and Lewis proposed the installation of a system of sewers, pumping stations and a 20-acre, two-cell lagoon to serve a population of 2,000 in Val Caron and Blezard Valley. Two alternative lagoon sites are suggested and both would discharge to the Whitson River. The report also outlined the necessary installations required to serve the area east of Val Caron and the Guilletville area. The report indicated that the sewage works would present a high cost to individual owners and that a water works system should be considered first.

2. Stream Water Quality

The Whitson River drains the northern portion of Blezard Township. No major outfalls were located discharging to the Whitson River in its passage through the township. The stream water quality is indicated in Table 7-2.

TABLE 7 - 2

TOWNSHIP OF BLEZARD - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5 - DAY BOD (PPM) | TOTAL SOLIDS (PPM) | PH AT LAB. | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|
| SVH 101.1 | WHITSON R. NORTH OF VAL CARON | OCT. 3/60 | 5.2 | 128 | 7.5 | 3 | 21 |
| | | AUG. 16/61 | 0.9 | 116 | | 2 | 150 |
| | | JUNE 3/63 | 1.3 | 132 | | 2.5 | 1,700 |
| SVH 97.9 | WHITSON R. SOUTH OF BLEZARD VALLEY | OCT. 3/60 | 1.8 | 148 | 7.9 | 3 | 29 |
| | | AUG. 16/61 | 0.9 | 138 | | 2 | 0 |
| | | JUNE 3/63 | 1.3 | 162 | | 2.6 | 1,200 |

The chemical and bacteriological quality has generally appeared satisfactory during the sampling surveys.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

1. A water works system should be initiated to serve the community of Val Caron and designed to provide future expansion to serve the Blezard Valley and McCrea Subdivision areas.

2. Test-drilling should be carried out to determine the feasibility of obtaining water from ground-water sources.

V RECOMMENDATIONS FOR POLLUTION CONTROL

A system of sanitary sewers and oxidation pond should be constructed to serve the Val Caron area including provision for expansion to include the Blezard Valley and McCrea Subdivision areas.

## TOWNSHIP OF CAPREOL

I GENERAL

Capreol Township is located north-east of the City of Sudbury abutting the Wanapitei Provincial Forest on the south. The Town of Capreol adjoins the north-west corner. Approximately 1,100 persons live in the community of Hanmer, two-thirds of which lies in Capreol Township. The other population concentrations are the Charette Trailer Park and the R.C.A.F. Falconbridge Station. The remainder of the 2,974 assessed population is scattered along Highway #545 and the secondary township roads. No industrial operations presently exist in the township and agriculture is carried out only on a limited scale.

II WATER SUPPLY

All water for private residences is obtained from shallow wells which generally provide water with satisfactory bacterial and chemical quality. Increased population densities in the Hanmer area will eventually deplete the shallow aquifers and difficulties may also be experienced with contamination from septic tank systems.

The R.C.A.F. Falconbridge Station is served by two drilled wells capable of producing 160,000 gpd each. Chlorine is applied to the supply. Storage consists of a 100,000-gallon elevated tank and an interconnected underground reservoir. The daily consumption is approximately 79,000 gallons.

TABLE 7 - 3

TOWNSHIP OF CAPREOL - GROUND WATER RCAF FALCONBRIDGE

| DATE | HARDNESS AS CaCO3 (PPM) | ALKALINITY AS CaCO3 (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | pH AT LAB. |
|---|---|---|---|---|---|
| JUNE 6/63 | 126 | 98 | 0.24 | 6 | 7.3 |

The water is slightly hard but otherwise chemically satisfactory for domestic consumption.

The Charette Trailer Park(44 trailers) in Concession II, Lot 8 obtains an adequate supply of good quality water from a well-point in sand and fine gravel at a depth of 20 to 30 feet.

Potential Additional Water Supplies

In 1956, a test hole drilled in Concession II, Lot 12, penetrated a sand and gravel aquifer from eight to 32 feet that was pumped at 100 gallons per minute for two hours with a drawdown of five feet from a static level of eight feet. In addition, a deep test hole

drilled in the area for the Department of Highways indicates the possibility of finding water-bearing gravel horizons at depths of about 200 feet. In summary, the conditions in the western part of the township north of a line between the south-west corner and the R.C.A.F. wells are favourable for the occurrence of good ground-water supplies.

## III WATER POLLUTION

### 1. Sanitary Waste Disposal

#### (a) Existing Conditions

Sewage disposal in the township consists of private septic tank systems and outdoor privies. Installation of septic tank systems is supervised by the Sudbury and District Health Unit. The soil in the area is sandy which permits the tile bed systems to function properly. However, as development continues at its present rate in the hamlet of Hanmer, the soil may eventually become saturated and as a result contamination of the shallow wells may occur.

The R.C.A.F. Falconbridge Station is served by a system of sanitary sewers discharging to a 4.3-acre lagoon. The lagoon effluent overflows to a small intermittent watercourse tributary to the Whitson River. The lagoon serves approximately 730 persons, 535 of which remain on the base full-time. The efficiency of treatment is indicated in Table 7-4 which summarizes 1962 composite sampling results.

TABLE 7 - 4

TOWNSHIP OF CAPREOL - SANITARY CHEMICAL QUALITY - RCAF FALCONBRIDGE LAGOON

| | | 5-DAY BOD | SUSPENDED SOLIDS |
|---|---|---|---|
| RAW SEWAGE | PPM | 131 | 149 |
| FINAL EFFLUENT | PPM | 51 | 62 |
| EFFICIENCY | % | 61 | 58 |

Sewage from the operations building is treated in a septic tank and discharged to a hillside in an uninhabited area. The receiving and transmitting buildings are served with septic tanks that discharge to seepage pits.

(b) Proposed Sewage Works

Final approval has been granted for the installation of a sanitary sewer system and three-cell, twenty-one acre lagoon to serve the portion of the hamlet of Hanmer, situated within Capreol Township. The system is designed to serve 750 persons initially with future extensions to serve an anticipated population of 2500 persons. Sufficient area for expansion to serve the estimated ultimate capacity of 15,000 persons will be provided. The lagoon effluent will overflow to Moore Creek, a tributary of the Whitson River.

In order to adequately solve sewage disposal problems in this rapidly expanding area the sewer system should be extended to serve the portion of the hamlet of Hanmer located in Hanmer Township.

2. Surface Water Quality

The northern portion of the township is drained by the Vermilion River while the Whitson River flows through the southern portion. The condition of the Vermilion River is indicated in the following table.

TABLE 7 - 5

TOWNSHIP OF CAPREOL - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | PH AT LAB. | TURBIDITY IN SILICA UNITS | M.F. COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|
| SV 134,2 | VERMILION R. BELOW CAPREOL | OCT. 3/60 | 2.2 | 76 | 7.7 | 2 | 5,700 |
| | | AUG. 16/61 | 1.2 | 50 | | 1 | 40 |
| | | AUG. 8/62 | 1.8 | 64 | | 1.4 | 14,900 |
| | | JUNE 5/63 | 1.0 | 86 | | 1.7 | 2,500 |

The Vermilion River receives polluting wastes from the Town of Capreol. This is reflected in the adverse bacterial concentrations which have been indicated at the sampling point located approximately two miles downstream.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

1. A municipal water works system should be initiated for the community of Hanmer and the surrounding development.

2. Test-drilling should be carried out to determine the feasibility of developing ground-water sources.

V RECOMMENDATIONS FOR POLLUTION CONTROL

The lagoon system presently planned for the portion of the hamlet of Hanmer within Capreol Township should be extended to serve that part in Hanmer Township.

## TOWNSHIPS OF CASIMIR, JENNINGS AND APPLEBY

I GENERAL

The combined Townships of Casimir, Jennings and Appleby are located near the eastern boundary of the District of Sudbury. The population of these townships is 1,086. The only major concentration of population in these townships is at the community of St.Charles which contains approximately 45 homes, four stores, a hotel and a school. Hazel Park Farms Ltd., a turkey processing establishment, is located in the Township of Casimir.

II WATER SUPPLY

All water consumed in the townships is obtained from private wells.

In St.Charles, approximately 60 per cent of the residences have drilled wells with the remainder utilizing dug wells. The residents are satisfied with the palatibility and the quantity of the water from these supplies. However, if the community continues to grow, consideration should be given to providing a municipal water works system including fire protection.

Potential Additional Water Sources

The limited ground-water information available suggests that it may be possible to obtain a supply adequate for the requirements of St.Charles from sand and gravel beds near the community. The presence of sand and gravel at depth east of Casimir suggests that such deposits may have a considerable areal extent.

III WATER POLLUTION

A serious sewage disposal problem exists in the community of St.Charles. Raw sewage and septic tank effluents are discharged to the street ditches which drain to MacPherson Creek. A sample of water in the ditch indicated gross pollution. Conditions remain the same as when a sample was collected in June 1960. A copy of the analyses is given in Table 7-6.

TABLE 7 - 6

TOWNSHIPS OF CASIMIR, JENNINGS AND APPLEBY - ST. CHARLES DRAIN - SANITARY WATER QUALITY

| 5-DAY BOD (PPM) | SOLIDS TOTAL (PPM) | SOLIDS SUSPENDED (PPM) | SOLIDS DISSOLVED (PPM) | INDICATED NUMBER COLIFORMS |
|---|---|---|---|---|
| 85 | 596 | 480 | 116 | 10,000,000 |

The objectives for stream sanitation includes a maximum BOD of 4 ppm. and a maximum coliform concentration of 2400 organisms per 100 ml.

If the offending individuals cannot correct the existing problem by the installation of adequate septic tank and tile bed systems, the municipality should consider the installation of municipal sewerage works.

The process waste water from Hazel Park Farms Ltd. is discharged to a series of four septic tanks overflowing to a sub-surface disposal system consisting of 1,050 feet of field tile. A lagoon system of treatment is being considered.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

It is recommended that action be taken by the residents of St.Charles to provide satisfactory individual sewage disposal systems.

## TOWNSHIP OF CHAPLEAU

I GENERAL

The Township of Chapleau, with a population of approximately 3,750 occupies the north-east section of the unorganized Township of Chapleau and the south-east section of the unorganized Township of Panet which are located near the centre of the north-west section of the Sudbury District. The population is mainly employed by the CPR in Chapleau.

II WATER SUPPLY

1. Source

Water is obtained from Chapleau River.

2. Treatment Works and Water Quality

Pumping equipment consists of three units rated at 500 U.S. gpm,

650 U.S. gpm and 960 U.S. gpm. Chlorination is the only treatment afforded the water. The average daily pumpage is approximately 250,000 gallons.

The chemical quality of the treated water is indicated by the following results of the analyses of a sample obtained in June 1963.

TABLE 7 - 7

TOWNSHIP OF CHAPLEAU - WATER SUPPLY - CHEMICAL QUALITY

| HARDNESS AS CACO3 (PPM) | ALKALINITY AS CACO3 (PPM) | IRON AS FE (PPM) | CHLORIDE AS CL (PPM) | pH AT LAB. | COLOUR IN HAZEN UNITS | TURBIDITY IN SILICA UNITS |
|---|---|---|---|---|---|---|
| 40 | 24 | 0.23 | 1 | 6.8 | 65 | 0.7 |

The water is soft and is highly coloured.

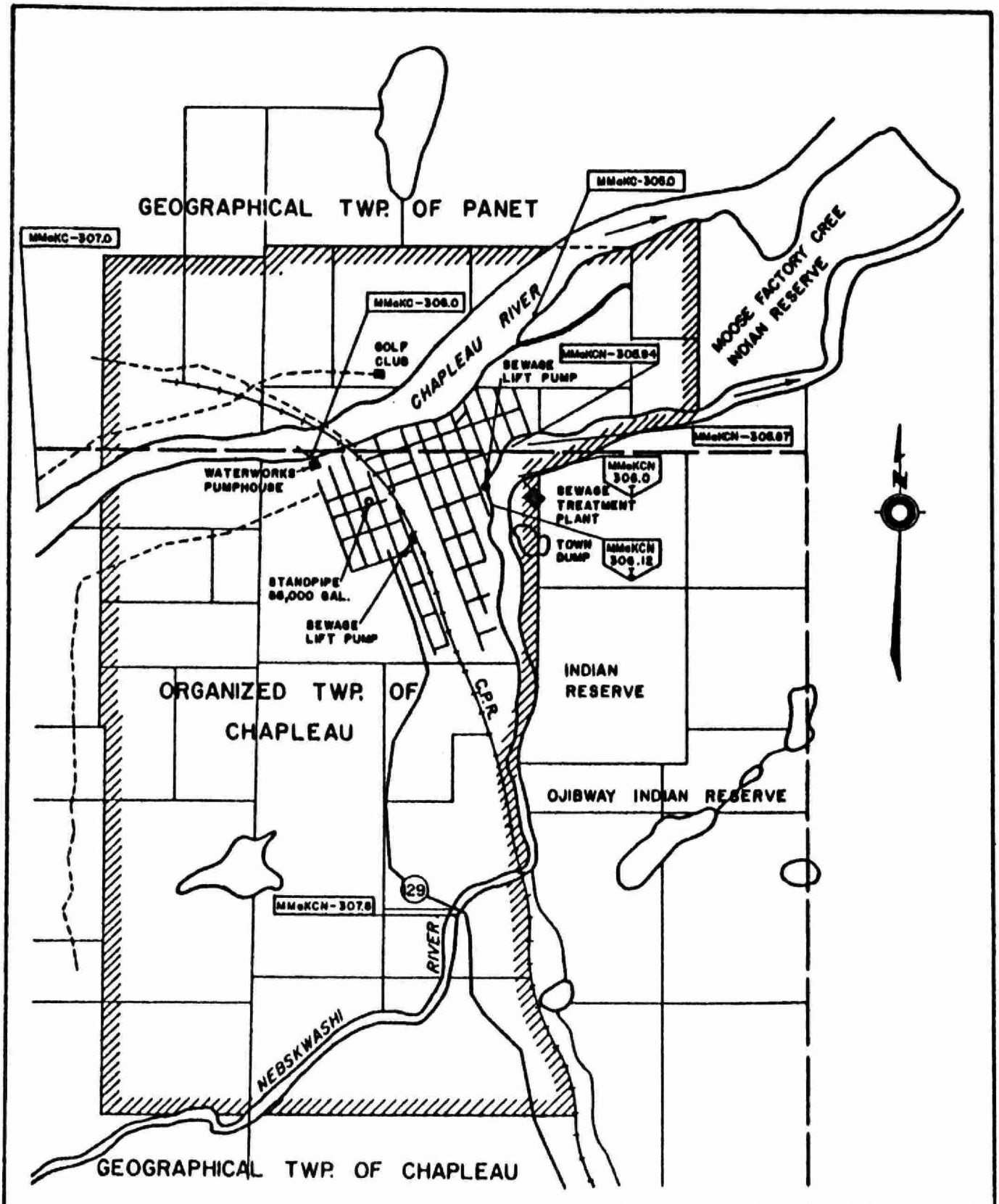
The raw water exhibits bacterial concentrations ranging from 2 to 1,100 coliforms per 100 ml. but the treated water is bacteriologically satisfactory.

3. Distribution

The distribution system is indicated on Figure 7-1. Storage is provided by an 85,000-gallon standpipe and there are approximately 700 services.

4. Water Requirements for the Future

It has been recommended in OWRC reports that the intake be repaired. If the population trend is to continue, the water demand by 1980 is expected to be 350,000 gallons per day. If the intake is repaired the existing system should be adequate to meet this demand. However, chemical treatment is required to reduce the colour content of the water to more acceptable values.




## LEGEND

MMaKC-307.0 – SAMPLING POINT SHOWING STREAM AND MILEAGE

MMaKCN 306.12 I – STREAM AND MILEAGE AT OUTFALL

– TYPE OF OUTFALL

T - S.T.P. EFFLUENT

I - INDUSTRIAL

**ONTARIO WATER RESOURCES COMMISSION**

**TOWNSHIP OF CHAPLEAU**

**WATER SUPPLY & WASTE WATER DISPOSAL**

**FIG. 7-1**

| | |
|---|---|
| SCALE: 1" = ½ MI. | |
| DRAWN BY: A.R.S. | DATE: JUNE, 1963 |
| CHECKED BY: A.C. | DRAWING No: 63-102 |

Potential Additional Water Supplies

No large capacity wells have been developed in the Chapleau area but, the findings of a ground-water survey carried out by the Ground Water Branch of the Ontario Water Resources Commission in May of 1962 indicate that sufficient water to supply the municipality of Chapleau may be available from ground-water aquifers. It was recommended in the survey report that any test-drilling program carried out should test the overburden to the north-west and to the south of the townsite. Studies indicate that buried, coarse, water-bearing deposits may be present in the areas recommended for testing with sufficient thicknesses to allow the construction of wells satisfactory for municipal purposes.

Analyses of well-water samples taken during the survey indicate that the ground water is likely to be of good quality and would require a minimum of treatment. There is some possibility that the undesirable brownish colour that is present in surface water may show up in any wells that are recharged more from these surface sources than by precipitation.

III WATER POLLUTION

1. Sanitary Waste Disposal

Domestic sewage is collected by a separate sewer system and directed to a primary treatment plant designed for 4,000 persons. Approximately 600 services are connected to the system and the sewered area which coincides with the street pattern is indicated on Figure 7-1. The system includes two pumping stations, one with an emergency overflow to the Nebskwashi River. The efficiency of

treatment is indicated by the average results of the analyses of ten sets of samples taken since May 1961. These are summarized in Table 7-8.

TABLE 7 - 8

TOWNSHIP OF CHAPLEAU - SEWAGE TREATMENT PLANT EFFICIENCY

| | RAW SEWAGE | | FINAL EFFLUENT | | REDUCTION | |
|---|---|---|---|---|---|---|
| | 5-DAY BOD (PPM) | SUSPENDED SOLIDS (PPM) | 5-DAY BOD (PPM) | SUSPENDED SOLIDS (PPM) | 5-DAY BOD % | SUSPENDED SOLIDS % |
| AVERAGE | 91 | 95 | 70 | 74 | 23 | 22 |
| HIGH | 165 | 151 | 142 | 185 | - | - |
| LOW | 46 | 38 | 30 | 29 | - | - |

The efficiencies of 23 per cent removal of BOD and 22 per cent removal of suspended solids are below the capabilities of the plant.

The effluent is discharged to the Nebskwaski River and is not chlorinated. It has been recommended in OWRC reports that the digester supernatant overflow should be directed to the inlet of the clarifier rather than to the effluent and that the effluent should be chlorinated during the summer months.

Approximately 80 houses at the north-west of the town are without sewer connections and are reportedly responsible for pollution of the Chapleau River upstream from the municipal water works intake.

2. Industrial Waste Disposal

The CPR is responsible for the discharge of oil to the Nebskwaski River.

Shops are operated for servicing and cleaning about 35 to 40 diesel engines per week. Waste results from steam and chemical cleaning of fuel oil filters, gear cases and pistons.

TABLE 7 - 9

TOWNSHIP OF CHAPLEAU - STREAM AND OUTFALL SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE | 5-DAY BOD (PPM) | SOLIDS TOTAL (PPM) | SOLIDS SUSP. (PPM) | SOLIDS DISS. (PPM) | pH AT LAB. | PHENOLS | ETHER SOLUBLES | PHOSPHOROUS $PO_4$ | TURBIDITY IN SILICA UNITS | M.F. COLIFORM COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MMAKC 307.0 | CHAPLEAU RIVER ABOVE CHAPLEAU ABOUT MARTEL MILL | JUNE 10/63 | 1.4 | 80 | - | - | | | - | | 1.3 | 38 |
| MMAKC 306.0 | CHAPLEAU RIVER AT CHAPLEAU WATER WORKS INTAKE | JUNE 10/63 | - | - | - | - | | | - | | 0.7 | 1,100 |
| MMAKC 305.0 | CHAPLEAU RIVER BELOW CHAPLEAU AT RANGER STATION | JUNE 10/63 | 1.4 | 74 | - | - | | | - | | 1.1 | 96 |
| MMAKCN 307.8 | NEBSKWASHI RIVER ABOVE CHAPLEAU AT DAM AT HIGHWAY #129 | JUNE 10/63 | 2.1 | 68 | - | - | | | - | | 1.3 | 4 |
| MMAKCN 306.0T | CHAPLEAU SEWAGE TREATMENT PLANT EFFLUENT TO NEBSKWASHI RIVER | JUNE 1961 TO JUNE 1963 | (AVERAGE OF 10 SAMPLES) 70. | 335 | 74 | 261 | | | - | | - | (MEDIAN OF 7 SAMPLES) 12,800,000 |
| MMAKCN 306.12I | C.P.R. OIL SEPARATOR EFFLUENT TO NEBSKWASHI RIVER | OCT. 26/60<br>JUNE 12/63 | 180<br>25 | 858<br>344 | 162<br>56 | 696<br>288 | <br>7.1 | <br>300 | 148<br>13 | <br>0 | - | 60,000 |
| MMAKCN 305.94 | NEBSKWASHI RIVER 100 YARDS BELOW SEWAGE TREATMENT PLANT | OCT. 26/60 | 7.2 | 82 | - | - | | | - | | 3. | - |
| MMAKCN 305.87 | NEBSKWASHI RIVER BELOW CHAPLEAU AT SEPARATE SCHOOL | JUNE 10/63 | 2.0 | 82 | - | - | | | | | 2.6 | 15,100 |

Two waste streams are pretreated through series oil separators and reach the Nebskwashi River through either a ditch at the south end of the yard or through a sewer at the north end.

Emulsifiers used in cleaning operations result in a difficult separation of oil and water and the escape of a milky emulsion to the Nebskwashi River is normal. At times, large quantities of oil have escaped to the river through the separator system.

Remedial measures recommended are removal of a storm water flow at the south end ditch to prevent flushing of the accumulated oil from the baffle compartments. The problem at the north end outfall is more acute because of the larger volume and heavier load of waste oil. It is recommended that the CPR investigate the use of steam or chemicals such as calcium chloride or ferric sulphate for breaking the emulsion.

3. Surface Water Quality

The analyses of samples of surface water are given in Table 7-9.

Samples with BOD and coliform counts exceeding the OWRC objectives of 4 ppm. and 2,400 coliforms per 100 ml. respectively were obtained from the Nebskwashi River downstream from the sewage treatment plant and the CPR outfall.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

A ground-water test-drilling program should be undertaken to determine the feasibility of using a ground-water supply since the present supply requires treatment for reduction of colour density.

V RECOMMENDATIONS FOR POLLUTION CONTROL

The CPR should take remedial measures to prevent the discharge of oil to the Nebskwashi River.

The sewage treatment plant efficiency should be improved. Digester supernatant overflow should be directed to the inlet of the clarifier and the effluent should be chlorinated during the summer months.

Adequate sewage disposal facilities should be provided in the unsewered north-west section of town.

## TOWNSHIPS OF COSBY, MASON AND MARTLAND

I GENERAL

The combined Townships of Cosby, Mason and Martland are located in the south-east extremity of the District of Sudbury. The population of these townships has decreased from 1,747 in 1954 to 1,599 in 1963. There are no major concentrations of population in the townships other than the Police Village of Noelville, where approximately 600 persons reside. There are no industries at Noelville, but pulp wood is cut in the vicinity and transported to Sturgeon Falls by truck.

II WATER SUPPLY

All water is obtained from private wells. Drilled wells, which comprise about one-quarter of the well supplies, are approximately 175 feet deep and obtain water from bedrock. About 5 per cent of the wells are sand points and the remainder are dug wells. The drilled wells generally provide ample quantities of potable water.

Potential Additional Water Supplies

The available ground-water information suggests that the larger ground-water supplies near Noelville will be obtained from the bedrock. Data on file with the OWRC indicate that there are only fair chances of obtaining a water supply adequate for the needs of a community system from this source. If sand and gravel beds are present near the community they should provide more favourable conditions for a ground-water supply. It generally should be possible to meet the needs of outlying areas through the use of rock wells.

Potential surface water sources are the French River to the south and the Wolseley River to the north of the Police Village of Noelville. It is extremely unlikely that these sources would be utilized, however, because of the respective distances from the community.

III WATER POLLUTION

Approximately 90 per cent of the residents of Noelville have flush-type toilet facilities which discharge to septic tanks overflowing to tile beds or leaching wells. These systems generally function satisfactorily except during spring run-off periods when some leachate may escape to Noelville Creek.

The results of the analyses of water samples from Noelville Creek collected on June 7, 1963, are given in Table 7-10.

TABLE 7 - 10
TOWNSHIPS OF COSBY, MASON AND MARTLAND - NOELVILLE CREEK - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|
| FXW 55.5 | NOELVILLE CR. ABOVE NOELVILLE | 2.2 | 122 | 5.5 | 2,400 |
| FXW 54.0 | NOELVILLE CR. BELOW NOELVILLE | 2.0 | 156 | 7.0 | 32,000 |

The objectives adopted by the OWRC for stream sanitation include a maximum of 2,400 coliforms per 100 ml. and a maximum BOD of 4 ppm. Attention is directed to the excessive coliform density in the water below Noelville.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

It is recommended that where individual disposal systems are unsatisfactory an effective program should be instituted to ensure the proper construction of new tile bed systems.

## TOWNSHIP OF DOWLING

I GENERAL

Dowling Township is located near the western edge of the Sudbury basin in the Onaping River and Vermilion River drainage areas. The 1963 assessed population is 1,571. Development is taking place near the eastern boundary of the township, and along Highway #544. The greatest population concentration is in the community of Larchwood, located in a sandy valley of the Onaping River. Growth is proceeding at a rapid rate. The community has increased from only a few houses in 1953 to a present population of approximately 800 to 900 persons. There are no industries located in the township with the majority of the residents commuting to the mines in Onaping Improvement District and the City of Sudbury for their livelihood.

## II WATER SUPPLY

Water is obtained from private well supplies. At present, provision of a communal water works system is not urgent but if population expansion continues at the rate of 50 homes per year water supply problems may develop.

### Potential Additional Water Supplies

The sand and gravel deposits near the Onaping River offer good potential sources for ground water.

Windy Lake, the Onaping River, and the Vermilion River are the only potential additional surface water sources in Dowling Township. Windy Lake, and the Vermilion River are available as surface water supplies. The Onaping River being subject to pollution upstream from Dowling Township would not constitute a satisfactory water supply due to the high heavy metal ion concentrations often experienced in this watercourse.

## III WATER POLLUTION

No municipal sewerage systems exist in the township. The township is enforcing a septic tank by-law which is administered by the Sudbury District Health Unit. To date, this has avoided any of the sanitary problems which are apt to develop in a rapidly developing community.

At the request of the Health Unit a pollution survey was undertaken by the OWRC during 1962. The survey was prompted by complaints of objectionable floating material on the Onaping River. Examination of samples collected from outfalls in the communities and

TABLE 7 - 11

TOWNSHIP OF DOWLING - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | pH AT LAB. | COPPER AS Cu (PPM) | NICKEL AS Ni (PPM) | IRON AS Fe (PPM) | TURBIDITY IN SILICA UNITS | M.F. COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|
| SVOW 107.0 | WINDY L. CR. JUST ABOVE JUNCTION WITH THE ONAPING RIVER | NOV. 8/62 | 1.4 | 152 | - | 0.2 | 4.6 | 0.27 | 1.8 | 60 |
| | | JUNE 3/63 | 0.9 | 44 | - | - | - | - | 0.7 | 148 |
| SVO 106.8 | ONAPING R. ONE MILE UPSTREAM FROM HIGH FALLS | NOV. 8/62 | 3.6 | 150 | - | 0.1 | 1.8 | 1.5 | 3.8 | 100 |
| | | JUNE 3/63 | 1.4 | 84 | - | - | - | - | 1.0 | 11,400 |
| SVO 99.9 | ONAPING R. AT HWY. WEST OF VERMILION R. JUNCTION | OCT. 3/60 | 1.7 | 116 | 7.1 | | | | 2 | 31 |
| | | AUG. 16/61 | 1.0 | 82 | | 0.08 | 0.0 | 0.65 | 1 | 16 |
| | | JUNE 3/63 | 1.2 | 76 | | | | | 0.8 | 1,100 |
| SV 97.0 | VERMILION R. AT HWY. BRIDGE 1½ MILES NORTH OF JUNCTION | OCT. 3/60 | 1.7 | 102 | 7.3 | - | - | - | 2 | 28 |
| | | AUG. 16/61 | 0.9 | 62 | - | - | - | - | 1 | 8 |
| | | JUNE 3/63 | 1.1 | 72 | - | - | - | - | 1.1 | 258 |

industries upstream, and of samples collected from the Onaping River and tributary streams, did not indicate adverse sanitary conditions. However, the effect on the Onaping River of the domestic and trade waste discharges upstream from Dowling Township is still under study. The samples collected to date are included in Table 7-11.

The bacterial quality of the Onaping River and Vermilion River in the township has been generally satisfactory during the past surveys. A sample above High Falls, on June 3, 1963, showed a bacterial concentration in excess of 2,400 coliform organisms per 100 ml. Concentrations of nickel, copper, and iron ions have also been recorded in the Onaping River.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

It is recommended that ground-water investigations be carried out in the Larchwood area in preparation for the development of a communal water supply to meet the needs of the expanding population.

V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations in this regard at this time.

## TOWNSHIP OF DRURY, DENISON & GRAHAM

I GENERAL

The combined Townships of Drury, Denison and Graham are traversed by Highway #17 and are located south-west of the City of Sudbury. The 1963 population is 1,800.

Industrial activity has been confined mainly to the operation of INCO's Crean Hill Mine. The mine townsite comprises four homes, a cookhouse and a bunkhouse. Operations at this mine were recently suspended.

## II WATER SUPPLY

Residents throughout the townships obtain water from private wells. The quantity and quality was reported to be satisfactory.

## III WATER POLLUTION

Domestic sewage from residences in the townships is discharged to private septic tank system or outdoor privies. Installation of septic tank systems is under the supervision of the Sudbury and District Health Unit.

TABLE 7 - 12

TOWNSHIPS OF DRURY, DENISON & GRAHAM - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|
| SVJ 70.2 | JUNCTION CREEK AT BRIDGE ABOVE SIMON LAKE | JUNE 21/60 | 2.1 | 298 | | |
| | | SEPT.28/60 | 2.6 | 530 | | 17 |
| | | AUG. 16/61 | 3.6 | 530 | 2.0 | 3 |
| | | AUG. 1/62 | 2.6 | 638 | 11.0 | 6,000 |
| | | JUNE 3/63 | 0.9 | 568 | 10.0 | 228 |
| SVJ 68.6 | JUNCTION CREEK BELOW SIMON LAKE | JUNE 21/60 | 1.2 | 362 | | 10 |
| | | SEPT.28/60 | 2.0 | 410 | 1.0 | 14 |
| | | AUG. 16/61 | 1.9 | 494 | 1.0 | 1 |
| | | AUG. 1/62 | 0.7 | | 11.0 | 600 |
| | | JUNE 3/63 | 1.3 | 524 | 9.0 | 2,700 |
| SV 65.4 | VERMILION R. AT HWY.#17 | JUNE 21/60 | 0.5 | 72 | | |
| | | SEPT.29/60 | 1.9 | 54 | 1.0 | 40 |
| | | AUG. 10/61 | 0.7 | 90 | 1.8 | 8 |
| | | JUNE 3/63 | 1.2 | 94 | 2.5 | 670 |

There were no outfalls located within the townships, but results of samples taken at three established points are tabulated in Table 7-12. These results are indicative of satisfactory water quality with the exception of a 6,000 coliform count obtained one mile downstream from the confluence of Meatbird Creek which receives sanitary waste water from the Town of Lively.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations in this regard at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations in this regard at this time.

## TOWNSHIP OF FALCONBRIDGE

I GENERAL

Falconbridge Township is located at the east end of the Sudbury nickel area, and the inhabitants are largely dependent on the nickel mining activities of Falconbridge Nickel Mines Ltd. The main centre of population is the Falconbridge Townsite adjacent to the Falconbridge Nickel Mines Ltd. smelter. Its population is approximately 1,200. Smaller population centres exist in Happy Valley south of the townsite, and around Sudbury Airport. Much of the Township is undeveloped and is characterized by small bedrock hills and large swampy areas.

The Falconbridge Nickel Mines Ltd. operates the Falconbridge Mine, East Mine, a concentrator, a smelter and a pyrrhotite plant in the township.

## II WATER SUPPLY

### 1. Source

Falconbridge Townsite obtains water from a drilled well located on the west side of Boucher Lake.

The outlying residential areas obtain water from private wells.

The Sudbury Airport buildings and surrounding residences obtain water from an infiltration well adjacent to a kettle lake.

Water for the Falconbridge Nickel Mines Ltd. mining, milling, and smelter operations included East Mine is obtained from the townsite well and three drilled wells located immediately east of Boucher Lake. A standby supply from Boucher Lake is also available.

### 2. Treatment Works and Water Quality

Presently the townsite well operates continuously at 2,000 gpm, with the excess water discharged to the mining operations distribution system. Chlorination constitutes the only form of treatment.

Pumpage records are not being maintained, however it is estimated that the combined water pumpage from the townsite and mine wells is approximately 4.0 to 5.0 mgd. Two of the mine wells are operated alternately while the third is maintained as a standy. The Boucher Lake supply is chlorinated but is used only for emergency purposes.

The supply at Sudbury Airport is chlorinated.

4. Water Requirements for the Future

The population of Falconbridge Township has been fairly static over the past five years. The present well supplies serving the townsite and the mine operations are adequate to meet present demands. Increased demands may result from industrial expansion in the area.

5. Potential Additional Water Supplies

International Water Supply Limited conducted a test-drilling program during 1960, north of the Falconbridge Mine toward Wanapitei Lake. The program disclosed that the sand and gravel beds associated with the knob and kettle topography of the area are intermixed with abundant silt, and the securing of a large water supply is not easy. However, one test-hole suggesting a well capacity of 1000 gpm was obtained. It is likely that continued exploration for ground-water supplies in the sand and gravel areas adjoining the kettle lakes would meet with further success.

Lake Wanapitei, located approximately six miles north of the townsite would, after treatment, provide an inexhaustible source of good quality water.

III WATER POLLUTION

1. Sanitary Waste Disposal

(a) Present Conditions

Sanitary sewage from the Falconbridge Townsite and the industrial buildings flows to the sewage treatment plant consisting of two parallel septic tanks followed by two standard rate trickling filters. The effluent from the plant discharges to Emery Creek. The

facilities were designed to serve 2,400 persons.

The extent of the sewered area is shown in Figure 7-2.

The degree of treatment provided by the plant is indicated by the results of composite samples obtained during 1962 of which average values are given in Table 7-14.

TABLE 7 - 14

TOWNSHIP OF FALCONBRIDGE - TOWNSITE S.T.P.

| | | 1962 COMPOSITE SAMPLE RESULTS | |
|---|---|---|---|
| | | AVG. BOD | AVG. S.S. |
| RAW SEWAGE | PPM | 121 | 200 |
| FILTER EFFLUENT | PPM | 22 | 34 |
| EFFICIENCY | % | 82 | 83 |

The effluent conformed to the OWRC objective during most of the year. However, sloughing off of the bacterial growth from the filter periodically increased the BOD and suspended solids above the objectives. Improved treatment could be obtained by providing final settling tanks and recirculation similar to that usually associated with trickling filter installations.

Sanitary sewage from the reduction plant, service plants, and office buildings is collected and treated at the townsite sewage plant. The smelter and crusher are served by a septic tank, the effluent from which is directed to a tile bed at the base of the granulated slag pile. Sewage from the mine dry at No.5 shaft is treated in a septic tank which overflows to the tailings area. Sanitary sewage from the East Mine is discharged to two parallel septic tanks which overflow to a swampy area tributary of Emery Creek. Problems resulting in stream pollution have previously been experienced with the operation of the septic tank installations.

In the rural areas of the township the Sudbury District Health Unit supervise private septic tank installations.

Five outfalls were located in Falconbridge Township. Two were septic tank effluents from the mines, one was from the previously used tailings area, another was the smelter effluent, and the other was the town sewage treatment plant effluent. The sewage plant outfall was the only one discharging directly to a watercourse.

(b) Proposed Sewage Works

Suggestions to improve existing treatment at the townsite plant are included in the previous section. If any increase in population is anticipated in the community, an oxidation pond would provide more satisfactory treatment of domestic wastes.

2. Industrial Wastes

The Falconbridge and East Mines employ 750 and 160 persons respectively and produce 3,500 tons of raw ore daily based on a five-day week. The combined mine water discharge from the two mines averages approximately 400,000 gpd and discharges to a swampy area(the old tailings area) and drains to Emery Creek.

The concentrator plant employs 120 persons and processes 3,000 tons per day of raw ore on a continuous basis. From the concentrator, material can go to waste, to the smelter, to the pyrrhotite plant or to sand-fill operations. The tailings from the concentrator average 1.1 mgd and are pumped to Fault Lake which has no visible outfall.

The smelter unit reduces the concentrate to a copper-nickel matte for shipping. This operation employs 440 persons and operates continuously. The majority of the wastes from this unit are cooling waters. These wastes are discharged at a rate of approximately 1.5 mgd to Boucher Lake.

Approximately 300 tons per day of concentrates are sent to the pyrrhotite plant. This plant employs 70 persons and its function is to produce an iron concentrate. Since the process is confidential, the nature of the use of water is not known other than the fact that the waste water is primarily process water and not cooling water. The wastes from this plant are discharged to the old tailings area at a rate of approximately 1.0 mgd and drain to Emery Creek.

3. Surface Water Quality

The Falconbridge Townsite is drained by Emery Creek. Normally, Boucher Lake is the source of Emery Creek. Low water levels were experienced during 1962 which resulted in sewage discharged to Emery Creek gaining access to Boucher Lake. Consequently, the creek has been dammed near the lake. Therefore, for some distance downstream sewage effluent, mine water and the effluent from the old tailings area constitute the total flow in Emery Creek.

The results of analyses performed on samples obtained from the outfalls and Emery Creek are given in Table 7-15.

On one occasion the bacteriological quality of Emery Creek downstream from the sewage treatment plant exceeded the OWRC objective.

TABLE 7 - 15

TOWNSHIP OF FALCONBRIDGE - STREAM & OUTFALL SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | COPPER AS Cu (PPM) | IRON AS Fe (PPM) | NICKEL AS Ni (PPM) | pH AT LAB. | PHENOLS (PPB) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FWYR67.9-1 | SMELTER EFFLUENT | JUNE 3/63 | 2.7 | 1010 | | | 0.22 | 0.65 | 0.0 | 7.9 | 3 | 5.0 | |
| FWYR67.4 | EMERY CR. AT OUTLET BOUCHER LAKE | SEPT.29/60 | | 750 | | | | | | | | | 70 |
| FWYR67.3T | FALCONBRIDGE TWP. S.T.P. EFFLUENT | (62 Avg.) | 22 | | 34 | | | | | | | | |
| FWYR67.1 | EMERY CR. JUST BELOW OUTFALL FROM S.T.P. | SEPT.29/60 | | 878 | | | | | | | | 10 | |
| | | DEC. 16/60 | 3.4 | 774 | | | | | | | | 7 | 1,200,000 |
| FWYR66.7-1 | OLD TAILINGS AREA DISCHARGE | JUNE 3/63 | 9.0 | 2976 | 50 | 2926 | 1.7 | 125.0 | 9.3 | 3.5 | 10 | | |

However, Emery Creek traverses relatively uninhabited areas before its junction with the Wanapitei River. The old tailings area overflow adds significant quantities of iron, copper and nickel. The new tailings area in Fault Lake, (a kettle lake with no outlet) should reduce this pollution load.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

It is recommended that consideration be given to refinement of the domestic sewage treatment facilities.

## TOWNSHIP OF HAGAR

I GENERAL

The Township of Hagar is situated approximately 30 miles east of Sudbury. The only concentrations of population in the township are the hamlets of Markstay and Hagar. There are approximately 250 residents in Markstay and approximately 100 persons in the part of the hamlet of Hagar located in the Township of Hagar. The balance of the township population is rural. The population of Hagar Township as listed in the 1963 Municipal Directory is 848.

II WATER SUPPLY

Almost all domestic water in the township is obtained from private wells with private springs being used in several instances. A few of the private wells are drilled wells and the quality and quantity of the ground water is generally satisfactory.

Potential Additional Water Supplies

The scant information available on ground-water conditions suggests that there are fair chances of obtaining good ground-water supplies from sand and gravel beds in the plain areas, especially near the Veuve River and its tributaries.

The Veuve River could provide a surface water supply, subject to treatment being provided.

III WATER POLLUTION

Private septic tank systems or outdoor privies are used by all residents. The local health authorities are taking action at Hagar to have defective private sewage disposal systems repaired. There are no apparent problems in regard to sewage disposal at Markstay. The results of samples of the Veuve River in Hagar Township, collected on June 3, 1963, are recorded below(Table 7-16).

TABLE 7 - 16

TOWNSHIP OF HAGAR - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|
| FV 102.0 | VEUVE RIVER AT HAGAR | 1.2 | 92 | 8.0 | 570 |
| FV 108.7 | VEUVE RIVER AT BRIDGE SOUTH OF MARKSTAY | 2.0 | 84 | 6.0 | 150 |
| FV 109.4 | NORTH VEUVE RIVER AT SIDE ROAD NORTH OF MARKSTAY | 1.1 | 96 | 5.5 | 40 |
| FV 109.5 | VEUVE RIVER AT HWY. BRIDGE SOUTH-WEST OF MARKSTAY | 0.7 | 84 | 4.0 | 52 |

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations in this regard at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations in this regard at this time.

## TOWNSHIP OF HALLAM

I GENERAL

The Township of Hallam lies west of the Town of Espanola and is bisected by Highway #17. The only moderately heavy populated area within the township is the Town of Webbwood. The 1962 population of the township is 205. There are no industries located within the township.

Residents obtain water from private wells and no major future water requirements are foreseen.

II WATER POLLUTION

Domestic sewage is diposed of in private septic tank systems or privies. No problems in the operation of these installations were reported.

III SURFACE WATER QUALITY

There were no outfalls located within Hallam Township. The results of stream samples taken of the Spanish River are given in Table 7-17 and are of satisfactory quality.

TABLE 7 - 17

TOWNSHIP OF HALLAM - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|
| S 25.8 | SPANISH R. AT WEBBWOOD | SEPT.29/60 | 2.6 | 44 | 2.0 | 570 |
| | | OCT. 4/60 | 2.4 | 62 | 4.0 | 1,600 |
| | | JUNE 3/63 | 1.8 | 116 | 2.9 | 700 |

## IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations in this regard at this time.

## V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations in this regard at this time.

# TOWNSHIP OF HANMER

## I GENERAL

Hanmer Township lies north of the City of Sudbury in the Whitson Creek and Vermilion River drainage basin. Development occurs in scattered subdivisions in the south-eastern portion of the township chiefly along Highway #69, and in the area around the community of Hanmer on the eastern border. The 1963 assessed population is 5,043. Summer cottages and many permanent residences are located along Frenchman Lake, Hanmer Lake and the Vermilion River. Growth is occurring rapidly in the area with the migration of mine and smelter employees from Sudbury settling in the strictly residential developments.

International Nickel Co.of Canada Ltd. owns approximately five per cent of the township land but at present no major industries are operating in the township.

In order to provide a more orderly development of Hanmer Township, The Hanmer Township Planning Board retained the firm of Sawchuck and Peach Co. to carry out a planning survey. The first stage, Background of Existing Conditions, has been completed as a preliminary step towards development of The Official Plan for the area to be followed by a third stage referred to as the "Restricted Area By-Law".

## II WATER SUPPLY

All water is obtained from private shallow wells in sand or gravel overburden. As development proceeds in the township to the

anticipated 10,000 population predicted for 1980, a municipal water supply network to serve the various subdivisions will become more desirable. Adequate water supply facilities should aid in developing the areas between subdivisions, and consequently create a more consolidated growth pattern.

Extensive shallow, sand and gravel deposits in Hanmer Township indicate that ground-water supplies will likely be available to meet the demands of an increased population. Test-drilling completed in the hamlet of Hanmer in 1956 located a large supply of water in coarse sand and gravel from 10 to 40 feet below the land surface. The test holes were pumped at 100 gallons per minute with a resultant drawdown at two hours of about five feet to pumping levels around 14 feet. Further test-drilling, carried out by International Water Supply Limited, during 1962, indicated that the area of Lots 1 to 6 inclusive of Concessions I to IV should be capable of providing 3.6 mgpd from the unconfined sand and gravel aquifer which extends to a depth of about 40 feet. The iron content of water from this aquifer may be slightly in excess of the recommended 0.3 ppm. and may require treatment, otherwise the chemical quality will be satisfactory for domestic consumption.

In order to serve the township effectively wells could be located at the centre of each subdivision and as population densities increase the system could be interconnected to form a municipal distribution network.

## III WATER POLLUTION

### 1. Sanitary Waste Disposal

All domestic sewage from residences is discharged to private septic tank installations and outdoor privies. Problems in the operation of tile bed systems have been experienced because of a relatively high water table. Municipal sewage works, providing for expansion to meet the future population density would be desirable. The Hanmer area and subdivisions along Highway #69 immediately north of Val Caron should develop a sewer system in conjunction with Capreol Township and Blezard Township respectively. The intervening areas could connect to these systems, or develop separate installations; dependant upon economic considerations.

A small activated sludge treatment plant serves the Woodland Hotel in the community of Hanmer. This unit discharges an effluent to a street ditch and subsequently to the Whitson River. In the past, treatment results have not been entirely satisfactory.

### 2. Surface Water Quality

The township is drained by the Vermilion River flowing in a westerly direction across the northern half, and by tributary streams of the Whitson River to the South.

The water quality is shown by the sample results given in Table 7-18.

TABLE 7 - 18

TOWNSHIP OF HANMER - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | PH AT LAB. | IRON AS Fe (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|
| SV 134.2 | VERMILION R. BELOW CAPREOL | OCT. 3/60 | 2.2 | 76 | 7.7 | | 2 | 5,700 |
| | | AUG. 16/61 | 1.2 | 50 | | | 1 | 40 |
| | | AUG. 8/62 | 1.8 | 64 | | | 1.4 | 14,900 |
| | | JUNE 5/63 | | | | | | 2,500 |

TABLE 7 - 18 CONT'D.

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | pH AT LAB. | IRON AS Fe (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|
| SV 127.3 | VERMILION R. AT BRIDGE, HWY. FROM WHITSON L. | OCT. 20/60 | | | 7.5 | 0.12 | 5 | 121 |
| | | AUG. 16/61 | 0.7 | 54 | | | 1 | 224 |
| | | JUNE 3/63 | 1.2 | 58 | | | 1.1 | 700 |
| SVH101.1 | WHITSON R. NORTH OF VAL CARON | OCT. 3/60 | 5.2 | 128 | 7.5 | | 3 | 21 |
| | | AUG. 16/60 | 0.9 | 116 | | | 2 | 150 |
| | | JUNE 3/63 | 1.3 | 132 | | | 2.5 | 1,700 |

Generally, the Vermilion and Whitson Rivers exhibit satisfactory sanitary chemical quality. The bacterial quality of the Vermilion River shows considerable improvement in passage through the township. The bacterial quality of the Whitson River is satisfactory.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

1. A municipal water supply system should be developed from ground-water resources for the various subdivisions in Hanmer Township along Highway #69.

2. A water supply for the portion of the community of Hanmer within Hanmer Township should be developed in conjunction with that portion of the hamlet in Capreol Township.

3. The southern subdivisions along Highway #69 should develop water supplies in conjunction with Val Caron.

4. The systems should be designed to facilitate the interconnection as the population density of the township increases.

V RECOMMENDATIONS FOR POLLUTION CONTROL

1. The portion of the community of Hanmer within Hanmer Township should consider connection to the sewer system presently being planned to serve that part of the hamlet of Hanmer within Capreol Township.

2. The more southerly subdivisions should develop sewage works in conjunction with Val Caron in Blezard Township.

# TOWNSHIP OF NAIRN

## I GENERAL

The Township of Nairn is located south-west of the City of Sudbury. The majority of the residents of Nairn Township reside in Nairn Centre, a hamlet situated adjacent to Highway #17. The 1963 population is 338.

Industries in the township include a sawmill north of Nairn Centre operated by the Pineland Timber Co.Ltd. and a hydro-electric generating station operated by the International Nickel Company of Canada Ltd. Agricultural activities are minimal.

## II WATER SUPPLY

The majority of the residents in Nairn Centre obtain water from shallow dug wells. Frequent water shortages have been reported during the summer months. A number of residents have installed deep well systems obtaining water of satisfactory quantity and quality. In November of 1962 a community water supply had been considered by the township council. A report on water supply was prepared by the OWRC exploring the possibility of a water supply system for Nairn Centre. However, the township council decided that it was not possible to proceed with these works at the present time.

### Potential Additional Water Supplies

Sand and gravel deposits are present on the south side of the Spanish River north of Nairn Centre on the property of Pineland Timber Company Limited and in an old gravel pit to the west. These gravels should be capable of providing large supplies of water and receiving

recharge from the Spanish River. The fine sands at surface near Nairn Centre present difficulties in well construction and are poor sources for large capacity wells. One well record is on file for Nairn Township. The well located between Highway #17 and the CPR tracks at Nairn Centre, is in sand to 120 feet, clay to 130 feet and gravel to 135 feet where it yielded abundant water during the pump test. The extent of the deep gravel aquifer could be determined by test drilling.

Another gravel pit lies just west of the Spanish River where it is crossed by Highway #17 and suggests the presence of good ground-water supplies. The plain between these two locations is considered a favourable, though probably variable, ground-water area.

Potential surface water sources in the township are the Spanish River and Bell Lake.

III WATER POLLUTION

Private residences are served by septic tank systems and outdoor privies. No problems in the operation of these installations were reported.

There were no outfalls located within the township. The analyses of stream samples taken from the Spanish River where it crosses Highway #17 are given in Table 7-19.

TABLE 7 - 19

TOWNSHIP OF NAIRN - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | pH AT LAB. | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|
| S 38.4 | SPANISH R. AT HWY.#17 | SEPT.29/60 | 1.7 | 26 | | 1.0 | 70 |
| | | JUNE 3/63 | 1.0 | 44 | 6.8 | 1.1 | 24 |

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

Consideration should be given to providing a communal water works system.

V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations in this regard at this time.

## TOWNSHIPS OF NEELON AND GARSON

I GENERAL

The United Townships of Neelon and Garson adjoin the City of Sudbury on the east and north-east. The main population concentration is around the community of Garson and the Garson Mine Townsite with scattered lineal development in the outlying areas.

In 1963 the assessed population totalled 5,345.

The main industry within the township is Garson Mine operated by the International Nickel Co.of Canada Ltd. About 1,000 persons are employed at this mine which produces approximately 200 tons of raw ore per hour.

The Town of Coniston is located within Neelon Township.

II WATER SUPPLY

1. Sources

Approximately 4,000 persons in the community of Garson are served by a municipally-owned deep well. A second well to serve Garson and the Skead Rd. housing development north of Garson is presently being equipped.

The City of Sudbury supplies water to individual residents along a boundary road.

The Garson Mine obtains water from a drilled well.

The Fischer Construction Co.Ltd. derives water from a kettle lake at the bottom of its gravel pit.

2. Treatment Works and Water Quality

The municipal well water receives no treatment. The rated capacity of the well pump is 210 gpm. Presently, the consumption is approximately 180,000 gpd. The new well will increase the system capacity to 0.66 mgd.

The water from the Garson Mine well receives chlorination. The well pump is capable of supplying 0.58 mgd and the estimated daily pumpage is 0.29 mgd.

The chemical quality of the water supplies is indicated in the following table.

TABLE 7 - 20

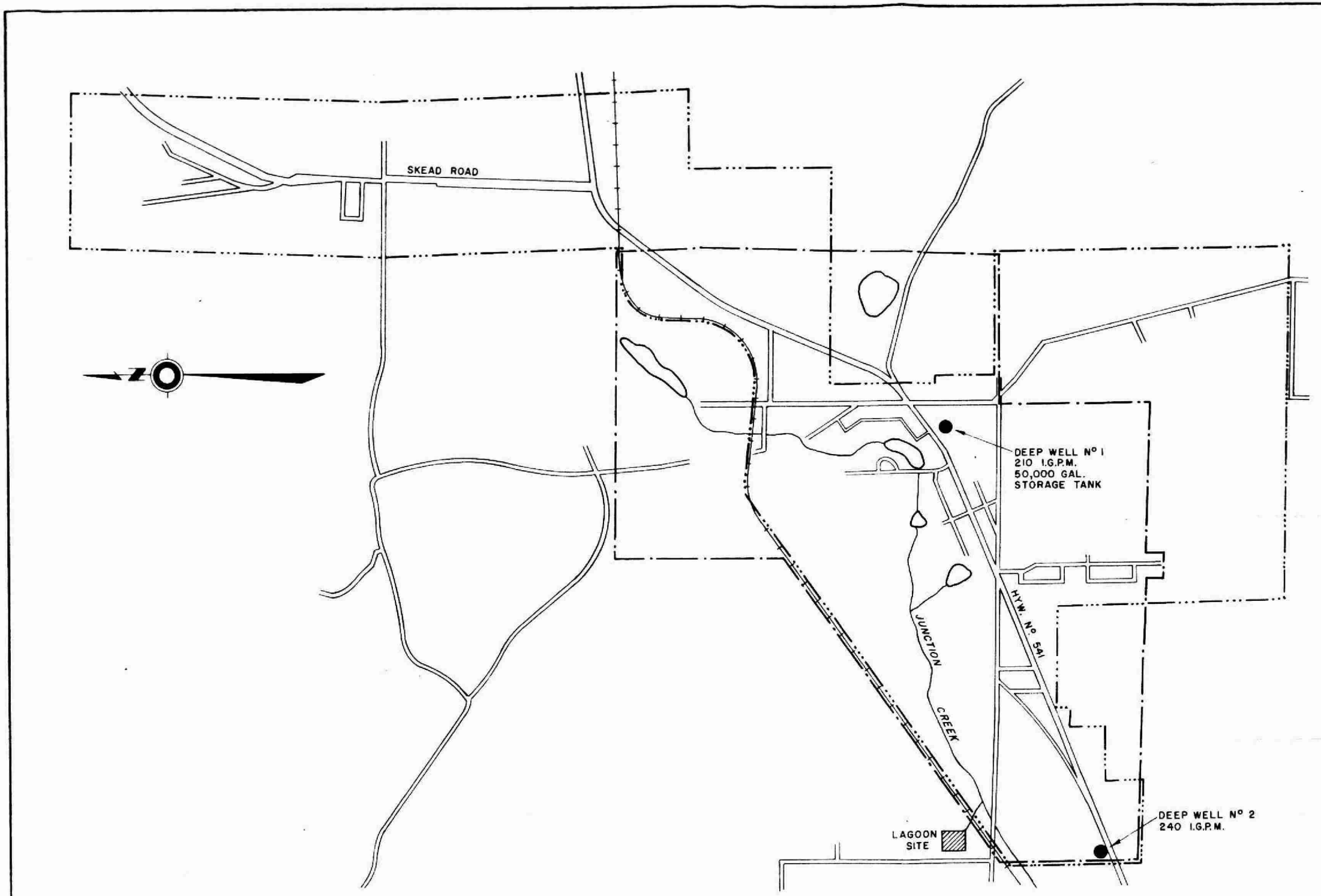
TOWNSHIPS OF NEELON AND GARSON - WATER SUPPLY - CHEMICAL QUALITY

| SOURCE | DATE | HARDNESS AS CaCO3 (PPM) | ALKALINITY AS CaCO3 (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | pH AT LAB. |
|---|---|---|---|---|---|---|
| WELL NO. 1 (MUNICIPAL) | NOV. 6/62 | 134 | 76 | 0.00 | 15 | 7.8 |
| WELL NO. 2 (MUNICIPAL) | APR. 25/62 | 106 | 76 | 0.10 | 11 | 7.6 |
| GARSON MINE WELL | NOV. 6/62 | 140 | 78 | 0.05 | 19 | 8.0 |

The chemical and bacterial quality of the municipal wells is satisfactory for domestic consumption. The Garson Mine well exhibits chemical qualities similar to the municipal supply.

3. Distribution

The extent of the municipal water works distribution system is outlined in Figure 7-3. Pressure control and storage for the




## LEGEND

PERIMETER OF WATER AREAS

PERIMETER OF SEWER AREAS

ONTARIO WATER RESOURCES COMMISSION

**UNITED TOWNSHIPS OF NEELON & GARSON**
**GARSON**

WATER SUPPLY AND WASTE WATER DISPOSAL

FIGURE 7-3

| | |
|---|---|
| SCALE: 1" = 2000' | |
| DRAWN BY: A.R.S. | DATE: JULY, 1963 |
| CHECKED BY: B.D. | DRAWING Nº: 63-193 |

community of Garson is provided by a 50,000-gallon elevated tank.

A 100,000-gallon storage tank serves Garson Mine.

4. Water Requirements for the Future

The population of Neelon and Garson should exceed 9,000 persons by 1980 if the present rate of growth continues. The increased well capacity will not be capable of supplying this predicted increase. Ground-water sources should be utilized to meet future demands.

5. Potential Additional Water Supplies

Additional ground-water supplies are favoured by the large sand and gravel deposits located along the Sudbury-Falconbridge Highway and by the good capacities of the Township and the International Nickel Company wells. However, careful pumping tests should be run to determine the effect of new wells on the existing supplies. Ground water locally is in short supply due to the presence of fine overburden materials. This is evidenced in the lack of success of test-drilling designed to find a water supply near the Skead Road housing development north of Garson.

The Wanapitei River located approximately six miles south of Garson provides an ample quantity of satisfactory quality water as indicated by the water supply at Coniston.

The City of Sudbury distribution system could be extended to supply the area. Presently, the extremities of the Sudbury system are only three miles from Garson.

## III WATER POLLUTION

### 1. Sanitary Waste Disposal

#### (a) Existing Conditions

The community of Garson is served by a system of sanitary sewers and a sewage treatment plant constructed and operated by the OWRC. Sewage flows to a lift station situated south-west of the community and is raised to a two-storey Imhoff tank. After combined settling and sludge digestion is effected, the sewage overflows to a four-cell, 28.8-acre oxidation pond. The lagoon effluent discharges to Junction Creek.

The lagoon system is designed to serve a population of 4,000 persons. By September 31, 1963, the contributing population from the community of Garson and the Garson Mine is expected to be approximately 3,000.

During 1962 the lagoon cells were being filled to their required operating level. Overflow to Junction Creek commenced in June 1963. A sample indicated a BOD of 24 ppm. and a suspended solids concentration of 53 ppm. in the effluent. Treatment results are expected to improve.

Installation of septic tanks in the unsewered areas is supervised by the Sudbury and District Health Unit.

Two outfalls were located in the municipality. One was the lagoon effluent to Junction Creek and the other was the mine water effluent from the Garson Mine.

(b) Proposed Sewage Works

The present system should be adequate to serve future needs. If necessary, extensions may be made to the present system by the construction of additional lagoon cells. Eventually, interconnection with the Sudbury trunk sewer system could be considered.

2. Industrial Waste Disposal

All drainage from the Garson Mine area is discharged to the surface on the mine property and flows to Junction Creek. Measurement of the mine water being pumped from underground indicates a discharge of 114 gpm.

3. Surface Water Quality

The Wanapitei River in the south-east, and Junction Creek in the middle flow south-west across the township. Analyses of samples obtained from the streams and outfalls are included in Table 7-21.

Both the Wanapitei River and Junction Creek have exhibited satisfactory bacterial and sanitary chemical qualities during the sampling periods. High nickel and copper concentrations have been experienced in Junction Creek downstream from the mine and developed areas.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

It is recommended that the present system be operated until such a time that trunk sewers from the City of Sudbury are extended to serve this region.

TABLE 7 - 21

TOWNSHIP OF NEELON & GARSON - STREAM AND OUTFALL SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE | 5-DAY BOD (PPM) | SOLIDS TOTAL (PPM) | SOLIDS SUSP. (PPM) | SOLIDS DISS. (PPM) | pH AT LAB. | COPPER AS Cu | NICKEL AS Ni | IRON AS FE (PPM) | TURBIDITY IN SILICA UNITS | M.F. COLIFORM COUNT PER 100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FW 53.0 | WANAPITEI RIVER AT POWER DAM | OCT. 20/60 | 1.5 | 48 | | | | | | | | 65 |
| | | JUNE 4/63 | 0.8 | 120 | | | | | | | 2.5 | 30 |
| FWC 54.6 | CONISTON CREEK AT ROAD EAST OF CONISTON | OCT. 20/60 | 2.6 | 128 | | | | | | | | 10 |
| | | JUNE 4/63 | 0.6 | 236 | | | | | | | 1.8 | 27 |
| SVJ 94.0 | LAGOON EFFLUENT | JUNE 17/63 | 24. | 318 | 53 | 265 | | | | | | |
| SVN 94.4 | GARSON MINE MINE WATER EFFLUENT | JUNE 17/63 | 1.8 | 2350 | | | | 4.1 | 47 | 0.05 | 115. | |
| SVJ 90.8 | JUNCTION CREEK AT SAND PIT RD. NEAR POWER SUB-STATION | SEPT. 28/60 | 1.3 | 120 | | | 7.7 | | | | | |
| | | JUNE 3/63 | 0.7 | 622 | | | 7.7 | 0.17 | 5.0 | 0.0 | | 38 |

# TOWNSHIPS OF RATTER AND DUNNET

## I GENERAL

The Townships of Ratter and Dunnet are situated on the eastern boundary of the District of Sudbury. The 1963 population of the combined townships is 1,390. The largest community is Warren with a population of approximately 550. Part of the hamlet of Hagar is located in Ratter Township.

## II WATER SUPPLY

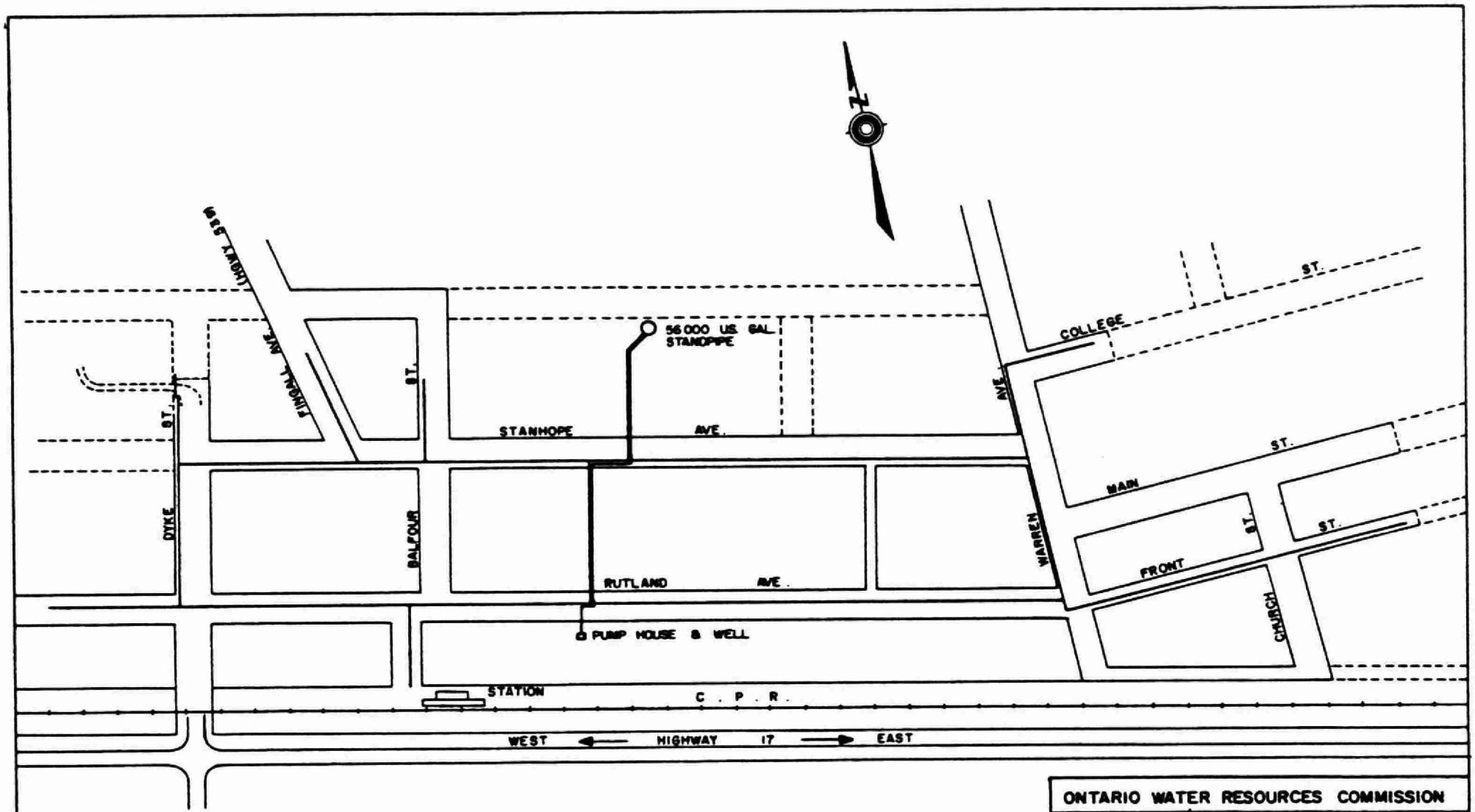
In the rural sections of the townships, the residents obtain water from private drilled wells which generally terminate in rock. The water supplies are generally adequate and there are no known problems with respect to quantity or quality.

The community of Warren has a municipal well supply which is an Ontario Water Resources Commission project. This system is shown on Figure 7-4. The well is 49.5 feet deep and has a 10-inch diameter steel casing. The well pump has a rated capacity of 100 U.S. gpm. There are 78 domestic services on this water works sytem and 25 commercial consumers. The well supplies hard water of good bacteriological quality.

TABLE 7 - 22

TOWNSHIPS OF RATTER & DUNNETT (WARREN) - WATER SUPPLY - CHEMICAL QUALITY

| DATE | HARDNESS AS CACO3 (PPM) | ALKALINITY AS CACO3 (PPM) | IRON AS FE (PPM) | CHLORIDE AS CL (PPM) | PH AT LAB. |
|---|---|---|---|---|---|
| MAY 29/62 | 202 | 178 | 0.13 | 12. | 8.1 |




ONTARIO WATER RESOURCES COMMISSION

# RATTER & DUNNET TOWNSHIPS

(WARREN AREA)
WATER SUPPLY
FIG. 7-4

| | |
|---|---|
| SCALE : 1" = 300' | |
| DRAWN BY : O.F. | DATE : MAY 1/63 |
| CHECKED BY : S.H. | DRAWING NO. : 63-159 |

Additional Potential Water Sources

It should be possible to meet increased farm water demand by the use of drilled wells. The sand and gravel deposits of the plains near Warren offer excellent potential for large ground-water supplies.

III WATER POLLUTION

Private septic tank installations and outdoor toilets are used by the residents of the Townships of Ratter and Dunnet including the community of Warren. These systems generally function satisfactorily.

At Warren some septic tank systems are defective, but action is being taken to have these corrected on an individual basis. The analyses of samples of the Veuve River collected on June 3, 1963, in the vicinity of Warren indicated satisfactory water quality. The results are recorded in Table 7-23.

TABLE 7 - 23

TOWNSHIPS OF RATTER & DUNNET (WARREN) - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|
| FV 94.6 | VEUVE RIVER AT BRIDGE JUST SOUTH OF WARREN | 1.0 | 86 | 6.5 | 110 |
| FVW 95.1 | WARREN CREEK AT HWY. JUST NORTH OF JUNCTION | 1.2 | 134 | 7.0 | 350 |

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations in this regard at this time with the exception that action should be taken to correct defective septic tank systems.

## TOWNSHIP OF RAYSIDE

I GENERAL

Rayside Township is located approximately three miles north-west of the City of Sudbury in Whitson Valley. Development in the area occurs in a linear fashion along Highways #544 and #644. Approximately 2,500 persons reside in the community of Azilda at the north-eastern end of Whitewater Lake. The total 1963 population is 5,168.

II WATER SUPPLY

At the present time water is obtained from individual dug and drilled wells. An independent perched aquifer serves the shallow wells while the deeper wells obtain water at depths of 90 to 170 feet from sand and gravel layers or from the surface of the bedrock. Past bacteriological sampling of the private well supplies serving the community of Azilda has indicated that the quality is questionable and a communal supply would be desirable.

Engineering reports by R.K.Kilborn and Associates, Consulting Engineers, were submitted to the OWRC in 1961 for preliminary approval of a deep well supply and distribution system to serve the more densely populated area of Azilda. Financing of the project was not

considered feasible and the project has been temporarily placed in abeyance.

Potential Additional Water Supplies

Water well records indicate the probable existence of a buried valley with associated deep gravel deposits running north-westerly from Concession I to V. These deep gravel deposits offer the best chances of obtaining a large ground-water supply, although a test-drilling program designed to test for the deep aquifer would also provide information on the shallower aquifers in the area.

In Lumsden Township to the north, it is deduced from the topography that potential sand and gravel aquifers will be present where the Nelson River and other parallel rivers discharge into Whitson Valley.

Potential surface water sources in Rayside Township are Whitewater Lake and the Whitson River. Both would supply sufficient water of satisfactory quality. Whitson River is too great a distance from Azilda to constitute an economical source. The use of Whitewater Lake would require the construction of a control dam on the effluent stream to Moore Lake in order that the water level in the neighbourhood of Azilda would be sufficient for the location of a water works intake.

III WATER POLLUTION

Sewage disposal in the township consists of private septic tank and pit privy systems, etc. No problems are anticipated in the rural areas. However, in the Azilda area, septic tanks present a

TABLE 7 - 24

TOWNSHIPS OF RAYSIDE - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | pH AT LAB. | IRON AS FE (PPM) | TURBIDITY IN SILICA UNITS | M.F. COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|
| SVH 97.9 | WHITSON R. SOUTH OF BLEZARD VALLEY | OCT. 3/60 | 1.8 | 128 | 7.9 | -- | 3 | 29 |
| | | AUG. 16/61 | 0.9 | 116 | | -- | 2 | 0 |
| | | JUNE 3/63 | 1.3 | 132 | | -- | 2.6 | 1,200 |
| SVH 89.3 | WHITSON R. ABOVE CHELMSFORD | OCT. 3/60 | 1.6 | 164 | 7.8 | -- | 3 | 31 |
| | | OCT. 20/60 | | | 7.0 | 0.7 | 2 | 40 |
| | | AUG. 16/61 | 1.0 | 144 | | -- | 2 | 30 |
| | | JUNE 3/63 | 1.6 | 176 | | -- | 2.1 | 58 |

problem because in most instances the ground-water table is high, particularly in the spring and following heavy rains. Under these conditions septic tanks occasionally overflow resulting in pollution of ground and surface waters.

Sewage treatment facilities to serve the Azilda area would be desirable.

A preliminary engineering report prepared by R.K.Kilborn and Associates was submitted to the OWRC proposing the construction of a system of sanitary sewers, five sewage lift stations and a 40-acre sewage lagoon. The lagoon was to be located in a westerly direction from the community discharging a chlorinated effluent to Brabant Creek. An alternative proposal for an activated sludge plant capable of serving 4,000 persons was also considered. Financial arrangements to provide this facility have been difficult and the schemes have not matured to date.

Rayside Township is drained by the Whitson River flowing in a westerly direction across the northern section. The south-eastern corner drains to Whitewater Lake and thence directly to the Vermilion River. The quality of the Whitson River is reflected in the analyses shown in Table 7-24.

The Whitson River exhibits satisfactory bacterial and chemical quality in its passage across the township.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

1. A communal water works system should be provided for the community of Azilda.

2. Test-drilling investigations should be carried out to determine the feasibility of utilizing ground-water resources.

V RECOMMENDATIONS FOR POLLUTION CONTROL

1. A sewerage system should be provided to collect and treat domestic wastes from the community of Azilda.

2. Consideration should be given to the provision of an oxidation pond treatment plant as originally proposed in past engineering studies.

## TOWNSHIPS OF SALTER, MAY AND HARROW

I GENERAL

The Townships of Salter, May and Harrow are located in the extreme south-west corner of the District of Sudbury. There are no industries in the township and activity in the area has declined since the reduction of the work force at Elliot Lake. The 1963 population is 615.

II WATER SUPPLY

The majority of the residents in the townships obtain water from dug wells that are less than 25 feet in depth. There are several drilled wells that obtain water in gravel deposits at a depth of 100 feet. The quantity and quality of the well water are generally satisfactory. No future water needs are foreseen at the present time.

Buried gravel deposits below the plains along the north and south of the Spanish River provide favourable conditions for good, ground-water supplies. The extent of the gravel is not known.

III WATER POLLUTION

All sewage is disposed of in private septic tank installations and outdoor privies, the latter being more common. The only complaints related to stream pollution were concerned with odours along the Spanish River that were characteristic of paper mill operations.

Surface Water Quality

There are no established sampling points on streams within the combined townships with the exception of those taken within the Town of Massey. Results of these samples are discussed in that section.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations in this regard at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations in this regard at this time.

## TOWNSHIP OF WATERS

I GENERAL

The Township of Waters is situated immediately west of the City of Sudbury. The 1963 population is 2,247, an increase of 1,000 in the past ten years.

There are several concentrated areas of population, however the Town of Lively is the only organized municipality within the township.

Industrial activities in the township are limited to the Iron Ore Recovery Plant operated by INCO and Canadian Industries Limited Plant #2.

II WATER SUPPLY

A large percentage of the residents in the township utilize drilled wells for household requirements. The quality and quantity were reported to be satisfactory. The remainder of the residents rely on dug wells for water supply.

The iron ore recovery plant draws water for domestic and industrial purposes from the Copper Cliff-Vermilion River water system. An additional industrial water supply is drawn from Kelley Lake.

Potential Additional Water Supplies

West of Lot 2, the plains area between Meatbird Creek and Junction Creek has good potential for additional ground-water supplies from sand and gravel deposits. As the texture of the drift in this area varies rapidly, a sizeable test-drilling program would be needed to test the supply. There is insufficient information to evaluate the ground-water supply in Concessions I to III, although the topography offers some encouragement for the presence of sand and gravel below the plains area.

III WATER POLLUTION

1. Sanitary Sewage Disposal

The majority of residences have septic tank disposal systems installed under the supervision of the Sudbury and District Health Unit. These systems are reported to be functioning satisfactorily.

Domestic sewage from INCO's iron ore recovery plant and Canadian Industries Limited Plant #2 is treated in septic tanks and discharged to a swampy area which drains to Kelley Lake.

2. Industrial Waste Disposal

The iron ore recovery plant uses magnetically recovered pyrrhotite from the Copper Cliff smelter to produce a high grade, pelletized iron oxide. Tailings from the iron ore recovery plant are carried as a slurry to the Copper Cliff tailings disposal area located north of Highway #17 for disposal. Condenser cooling water is discharged directly to Kelley Lake. Water used for quenching and other industrial purposes in the plant is discharged to a pond on the property and pumped to Copper Cliff tailings disposal area.

Canadian Industries Limited Plant #2 presently produces 360 tons of sulphuric acid per day from sulphur dioxide obtained from the flue gases from the iron ore recovery plant. The acid scrubbing wastes from the operation are treated with lime and returned to the iron ore recovery plant. The cooling water (25 gpm) joins the septic tank effluent and flows through a swampy area to Kelley Lake.

3. Surface Water Quality

There were no outfalls sampled in the township, however the streams receive several waste discharges from the adjoining municipalities of Copper Cliff, Lively and Sudbury.

The first sampling point on Junction Creek as it enters Waters Township is at SVJ 76.4. It is noted that nine of the twenty-four sample results had a BOD content in excess of the OWRC objective of

TABLE 7 - 25

TOWNSHIP OF WATERS - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | ACIDITY AS CACO3 (PPM) | PH AT LAB. | NICKEL AS NI (PPM) | COPPER AS CU (PPM) | IRON AS FE (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SVJ 76.4 | JUNCTION CR. AT RD. ¼ MILE BELOW OUTLET OF KELLEY LAKE | JUNE 21/60 | 3.3 | 490 | 20 | 470 | | | | | | | < 10 |
| | | JUNE 27/60 | 1.3 | 470 | 12 | 458 | | | | | | 6. | 23,000 |
| | | SEPT.28/60 | - | 578 | 8 | 570 | | 4.8 | 4.5 | 0.97 | 0.44 | | 7 |
| | | DEC. 15/60 | | | | | | | | | | | 0 |
| | | AUG. 16/61 | 1.0 | 650 | 14 | 636 | | 5.4 | 4.4 | 0.72 | 0.44 | | 0 |
| | | AUG. 23/61 | 1.5 | 696 | | | | | | | | 3. | |
| | | AUG. 29/61 | 3.2 | 644 | 18 | 626 | | | | | | 3. | |
| | | AUG. 1/62 | 0.5 | 794 | - | - | | 6.8 | 3.2 | - | 0.78 | 9.0 | 3,300 |
| | | APR. 4/61 | 9.0 | 466 | - | - | | | | | | 8 | |
| | | APR. 24/61 | 4.6 | 458 | | | | | | | | 8 | |
| | | MAY 3/61 | 11 | 618 | - | - | | 5.8 | 3.9 | .6 | | 3 | |
| | | MAY 3/61 | 8 | 596 | | | | 5.0 | 2.6 | 0.6 | | | |
| | | MAY 18/61 | 3.6 | 664 | 32 | 632 | | 4.2 | 4.8 | 1.2 | | | |
| | | JUNE 16/61 | 2.8 | 748 | 60 | 688 | | 5.7 | 4.2 | .9 | | | |
| | | JULY 4/61 | 2.0 | 680 | 18 | 662 | | 4.9 | 3.4 | .45 | | | |
| | | JULY 18/61 | 14 | 752 | 62 | 690 | | 7.6 | 5.4 | .5 | | | |
| | | JULY 31/61 | 2.8 | 616 | 22 | 594 | | 5.4 | 5.2 | .78 | | | |
| | | AUG. 4/61 | 2.0 | 624 | 22 | 602 | | 4.9 | 2.4 | .6 | | | |
| | | NOV. 20/60 | 4.4 | | | | | | | | | | |
| | | MAR. 21/63 | 4.8 | 1030 | 16 | 1014 | | 7.3 | | | 0.16 | | |
| | | JUNE 23/63 | 2.1 | 866 | | | | | 3.2 | .57 | 0.7 | 9.5 | 0 |
| | | APR. 25/63 | 4.4 | 736 | 11 | 725 | | | | | | | |
| | | MAY 29/63 | 19 | 690 | - | - | | | | | | 4.2 | |
| | | JUNE 3/63 | 2.1 | 866 | - | - | | 6.7 | 3.2 | 0.57 | 0.72 | 9.5 | 0 |
| SVJ 73.4 | JUNCTION CR. AT RD. TO MAKADA L. | JUNE 21/60 | 3.3 | 502 | 12 | 490 | | | | | | | 10 |
| | | OCT. 5/60 | 1.8 | 620 | - | - | 4 | 8.1 | 5.5 | 0.7 | 0.5 | | 0 |
| | | AUG. 16/61 | 1.1 | 634 | 24 | 610 | | 5.9 | 6.0 | 0.6 | 0.4 | | 0 |
| | | AUG. 1/62 | 1.3 | 790 | | | | 6.9 | | 0.16 | 1.0 | | 900 |
| | | JUNE 3/63 | 3.5 | 812 | | | | - | | - | - | | 8,000 |
| SVJLR76.8 | CREIGHTON CR. AT HWY. #536 | DEC. 15/60 | 6.4 | 936 | 38 | 898 | 90 | 4.4 | 51.0 | 6.0 | 1.2 | | 0 |
| | | AUG. 16/61 | 1.8 | 846 | 34 | 812 | | 4.9 | 25.8 | 1.48 | 0.4 | | 0 |
| | | AUG. 1/62 | 1.2 | 1138 | | | | 4.4 | | 0.84 | 0.68 | | 1,200 |
| | | JUNE 3/63 | 1.5 | 832 | | | | 4.6 | 28. | 2.1 | 0 | | 26 |
| SVJL 75.9 | MEATBIRD CR. AT HWY.#536 ABOVE LIVELY | OCT. 5/60 | 1.0 | 780 | - | - | | | | | | | 26 |
| | | DEC. 15/60 | 0.6 | 752 | - | - | 40 | 4.5 | 41 | 5.5 | 1.28 | | - |
| | | AUG. 16/61 | 1.6 | 750 | 54 | 696 | | 4.0 | 16.2 | 1.44 | 5.0 | | 0 |
| | | AUG. 1/62 | 0.8 | 1088 | | | | 4.1 | 46 | | 1.09 | | 28 |
| | | JUNE 3/63 | 0.7 | 766 | | | | 4.2 | 25 | 1.4 | 0 | | 214 |

TABLE 7 - 25 CONT'D.

TOWNSHIP OF WATERS - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | ACIDITY AS CaCO3 (PPM) | pH AT LAB. | NICKEL AS Ni (PPM) | COPPER AS Cu (PPM) | IRON AS Fe (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SVJL73.0 | MEATBIRD CR. AT HWY.#536 BELOW LIVELY | OCT. 5/60 | 8.0 | 542 | | | 10 | | | | | | 16,000 |
| | | DEC. 15/60 | 3.2 | 600 | 36 | 564 | 10 | 6.5 | 19 | 2.2 | 1.08 | | - |
| | | AUG. 16/61 | 2.2 | 620 | 44 | 576 | | 6.7 | 2.6 | 0.52 | 0.8 | | 30 |
| | | AUG. 1/62 | 1.5 | 730 | | | | 6.4 | | | | | 2,100 |
| | | JUNE 3/63 | 2.6 | 562 | | | | 6.6 | 6.5 | .75 | 1.32 | | 140 |
| SVJL71.9 | MEATBIRD CR. AT HWY.#17 | DEC. 15/60 | 3.2 | 452 | 16 | 436 | 10 | 6.6 | 14 | 1.7 | 1.04 | | 4 |
| | | AUG. 16/61 | 4.6 | 502 | | | | 6.9 | | | | 2 | 10 |
| | | AUG. 1/62 | 1.2 | 732 | | | | 5.7 | | | | | 224 |
| | | JUNE 3/63 | 1.6 | 532 | | | | - | | | | | 160 |
| SVJ 70.2 | JUNCTION CR. AT BRIDGE JUST ABOVE SIMON L. | JUNE 21/60 | 2.1 | 298 | 14 | 284 | | | | | | | - |
| | | SEPT.28/60 | 2.6 | 530 | 10 | 520 | | | | | | | - |
| | | DEC. 15/60 | 5.6 | 566 | - | - | 6 | 6.9 | 5.5 | 0.5 | 0.36 | | 1 |
| | | AUG. 16/61 | 3.6 | 530 | - | - | | 7.2 | | | | | 3 |
| | | AUG. 1/62 | 2.6 | 638 | - | - | | 8.0 | | | 1.6 | 11.0 | 6,000 |
| | | JUNE 3/63 | 0.9 | 568 | - | - | | | | | | 10.0 | 228 |

4 ppm., although the maximum was only 14 ppm. Several samples exhibited a depressed pH and all samples contained concentrations of copper and nickel.

Creighton Creek, a tributary to Meatbird Creek upstream from Lively contained concentrations of nickel and copper as high as 51.0 ppm. and 6.0 ppm. respectively.

Meatbird Creek, at sample point SVJL 73.0, downstream from Lively exhibited an excessive BOD on one occasion, and high copper and nickel concentrations were present in all sample results. Two samples at this point had an excessive coliform count.

## IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations in this regard at this time.

## V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations in this regard at this time.

CHAPTER EIGHT

## IMPROVEMENT DISTRICTS

PAGE NO.

### ONAPING IMPROVEMENT DISTRICT



### RENABIE IMPROVEMENT DISTRICT

# CHAPTER 8 - ONAPING IMPROVEMENT DISTRICT

## I GENERAL

The Onaping Improvement District is located north-west of the City of Sudbury in the Onaping River Watershed. It adjoins the Town of Levack on the south and east and consists of portions of Levack, Morgan, and Dowling Townships. The major centre is the Onaping Townsite, with a population of 1100.

Industrial operations in the municipality consist of the mining operations of Falconbridge Nickel Mines, namely; the Hardy Mine and Mill, Boundary Mine, Fecunis Lake Mine and Mill, and Onaping Mine.

The townsite and mining operations are shown on Figures 8-1 and 8-2. Growth in the municipality will be greatly affected by the extent of the development of Strathcona mine presently located within Levack Township.

## II WATER SUPPLY

### 1. Sources

The Onaping Townsite, Hardy Mine and Mill, and Boundary Mine are served by two drilled wells located within the townsite and owned by Falconbridge Nickel Mines Ltd.

A small settlement called Hillcrest Camp with a population of approximately 40 is served by a chlorinated supply from Moose Lake. This settlement will be abandoned by the Falconbridge Nickel Mines operations late in 1963.

Industrial water supplies exist at all the mine operations, as follows:

| Operation | Source |
|---|---|
| Hardy and Boundary Mines | Townsite wells (2) |
| Hardy Mill | Onaping River ✓ opposite to data contained within of page 197 |
| Onaping Mine | Gill Pond |
| Fecunis Lake Mine & Mill | Moose Lake |

2. Treatment Works and Water Quality

Chlorine is applied to the two townsite wells which have a combined capacity of 1.04 mgd. The average pumpage at the present time is estimated at 300,000 gpd.

Information on treatment and pumpage at the mine supplies is outlined in the following table.

TABLE 8 - 1

ONAPING IMPROVEMENT DISTRICT - MINE WATER SUPPLIES

| LOCATION | SOURCE | APPROXIMATE CONSUMPTION | | | TREATMENT |
|---|---|---|---|---|---|
| | | DOMESTIC | MINE | MILL | |
| HARDY MINE & BOUNDARY MINE | TOWNSITE WELLS | 500 | 200,000 | | CHLORINATION |
| HARDY MILL | ONAPING R. | | | 1,500,000 | NO TREATMENT |
| ONAPING MINE | GILL POND | 600 | 150,000 | | CHLORINATION |
| FECUNIS LAKE MINE | MOOSE LAKE | 1,050 | 960,000 | 4,000,000 TO 5,000,000 | CHLORINATION & ANHYDROUS AMMONIUM ADDITION |

NOTE - CONSUMPTION IN GPD.

The chemical quality of the water supplies is indicated by the following tabulated analyses of samples.

TABLE 8 - 2

ONAPING IMPROVEMENT DISTRICT - CHEMICAL QUALITY-WATER SUPPLIES

| LOCATION | DATE | HARDNESS AS CaCO3 (PPM) | ALKALINITY AS CaCO3 (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | pH AT LAB. |
|---|---|---|---|---|---|---|
| TOWNSITE WELL 1 | NOV. 13/62 | 84 | 29 | 0.10 | 21 | 6.8 |
| TOWNSITE WELL 2 | NOV. 13/62 | 72 | 28 | 0.10 | 15 | 6.7 |
| MILL POND | MAY 24/62 | 116 | 16 | 0.32 | 69 | 6.9 |
| MOOSE LAKE | MAY 23/62 | 58 | 0 | 2.10 | 6 | 4.0 |

The chemical quality of the townsite wells is excellent for domestic consumption. Routine analyses indicate a satisfactory bacterial quality of the treated water.

The water supply for the Onaping Mine is generally satisfactory with the exception of the iron content which slightly exceeds the recommended maximum of 0.3 ppm.

The Fecunis Lake Mine and Mill water supply is soft, the iron content is excessive, and the acidity results in aggressive characteristics.

Routine bacteriological examinations have indicated that the treated water at the mine water supplies, the townsite and Hillcrest Camp is satisfactory.

3. Distribution

The extent of the townsite distribution system is outlined in Figure 8-1. Storage is provided by a 50,000 gallon reservoir.

4. Water Requirements for the Future

The population growth in the Improvement District is not great and the present supplies should be adequate to meet immediate water demands. The development of Strathcona Mine may result in a population increase at the townsite. However, no problems are anticipated with meeting additional water demands.

5. Potential Additional Water Supplies

Abundant ground-water supplies have been obtained at Onaping and Levack from wells in coarse gravel formations adjoining the Onaping River. It can be expected that similar conditions elsewhere along

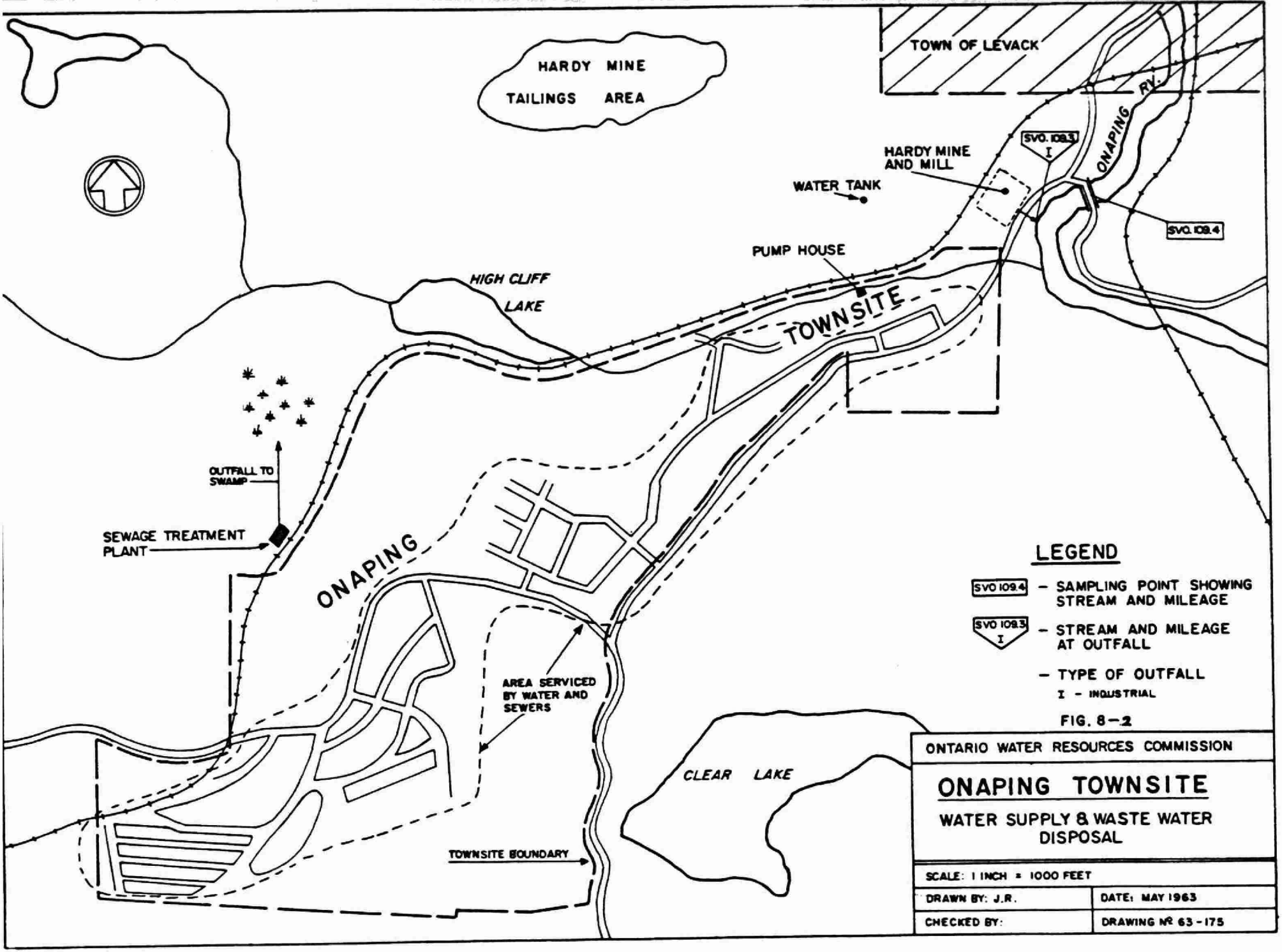



FIG. 8–2

ONTARIO WATER RESOURCES COMMISSION

# ONAPING TOWNSITE

## WATER SUPPLY & WASTE WATER DISPOSAL

| | |
|---|---|
| SCALE: 1 INCH = 1000 FEET | |
| DRAWN BY: J.R. | DATE: MAY 1963 |
| CHECKED BY: | DRAWING Nº 63-175 |

the river will yield further large quantities of water. If the water table is lowered substantially by pumping water from the sands and gravels, recharge from the river usually will take place. Falconbridge Nickel Mines Limited drilled a favourable test hole in Lot 11, Concession VI, of a former part of Dowling Township.

Chances of finding additional ground-water supplies are improved where present or former rivers entered lakes or widenings and deposited sand and gravel. The topography shown on map 41 1/11, Chelmsford West(Provisional Map- DND series 1st ed.), suggests that the following locations may have sand and gravel deposits that may be capable of yielding substantial ground-water supplies.

(1) The north edge of the Sudbury valley north of the Vermilion River about 2000 feet south-west of the dry weather road from Moose Lake to Larchwood.

(2) The area of subdued topography 11,000 feet north of Strathcona.

(3) The flat valley between Pike Lake and Seal Lake.

(4) The Onaping River approximately 12,000, 17,000 and 21,000 feet above Moose Creek.

Surface supplies to meet future demands could also be obtained from the Onaping River, preferably above Levack, and from Windy Lake south-west of Onaping Townsite. Both could provide water of good chemical and bacterial quality following conventional treatment.

## III WATER POLLUTION

### 1. Sanitary Waste Disposal

Sewage from the Onaping Townsite and mine bunkhouses is collected by a sewer system for treatment in a mechanically aerated, activated

sludge sewage treatment plant. The plant effluent is discharged to a swampy area that drains to High Cliff Lake and subsequently to the Onaping River. The plant is designed for 2,400 persons or 144,000 gpd. Presently, the sewage flow is estimated at 66,000 gpd.

The efficiency of treatment is satisfactory as indicated by the following summary of composite sample results obtained during 1962.

TABLE 8 - 3

ONAPING IMPROVEMENT DISTRICT - TOWNSITE S.T.P. EFFICIENCY

AVERAGE 1962 RESULTS

| | | BOD | SUSPENDED SOLIDS |
|---|---|---|---|
| RAW SEWAGE | PPM | 169 | 175 |
| FINAL | PPM | 18.3 | 13.6 |
| EFFICIENCY | % | 89 | 92 |

The method of sanitary waste disposal practised at each of the mining operations is outlined in Table 8-4.

TABLE 8 - 4

ONAPING IMPROVEMENT DISTRICT - SANITARY WASTE DISPOSAL AT MINES

| LOCATION | TREATMENT | DESIGN CAPACITY PERSONS | PERSONS SERVICED | EFFLUENT DISCHARGED |
|---|---|---|---|---|
| HARDY MINE & MILL AND BOUNDARY MINE | SEPTIC TANK | - | - | TO CRUSHED ROCK 50 TO 75 FT. FROM ONAPING R. |
| ONAPING MINE | SEPTIC TANK | 150-200 | 30-40 | OVER A RIDGE TO OPEN SOIL |
| FECUNIS LAKE - MINE MILL | SEPTIC TANK | 500 | 20 | TO BROKEN ROCK ON BANKS OF FECUNIS LAKE, DISCHARGING TO MOOSE CREEK |

A septic tank serves the small Hillcrest camp subdivision with the effluent seeping to a swampy area above Moose Lake.

At all mines, sanitary wastes from the underground are collected in sanitary cars and carried to the surface where they are directed to the appropriate septic tank.

2. Industrial Wastes

The Hardy and Boundary Mines are worked through a common shaft and produce 1700 tons of raw ore per day, five days per week. The mines employ 160 persons. Approximately 150,000 gpd of waste is pumped from the mines and discharged to the Onaping River.

The Onaping mine employs approximately 35 persons and produces 750 to 1000 tons of raw ore per day, five days per week. It is estimated that 50,000 U.S. gpd are pumped from the mine to Gill Pond.

The Fecunis Lake Mine is a joint operation between International Nickel Company and Falconbridge Nickel Mines Limited. Approximately 40 to 45 persons employed by Falconbridge Nickel Mines Limited and contractors work at the mine as well as International Nickel Company employees. The mine produces 3000 tons of raw ore per day, five days per week. Approximately 475,000 U.S. gpd of waste water is pumped from the mine to Fecunis Lake.

The Hardy Mill processes 1400 tons of raw ore per day received from the Hardy, Boundary and Onaping mines. The mill employs 40 to 50 persons and operates continuously. Tailings from the operation are discharged in a flow of 0.7 mgd to a 50-acre disposal area which has no apparent outfall. It is possible that water percolates from

this area to High Cliff Lake. Pyrrhotite concentrate is stock piled on the premises and drainage from this area estimated at 0.25 mgd flows to the Onaping River.

At the Fecunis Lake Mill ores from Fecunis Lake Mine and Onaping Mine are processed at a rate of 220 tons per hour. There are 70 mill employees and 61 service employees. The tailings from the operation are discharged in a flow of 1.9 mgd to an area north-west of Moose Lake. This area drains to Cranberry Lake and then to Moose Lake. An effluent from the sand fill operation at the mill (0.1 mgd) is discharged to Fecunis Lake.

For more detailed information and recommendations regarding the waste disposal practices of Falconbridge Nickel Mines Limited operations, reference should be made to Part II of this report which will be published at a later date.

3. Surface Water Quality

The majority of the Improvement District is drained by the Moose Creek system, tributary to the Onaping River, which flows through the western half of the municipality, in a southerly direction. The effect of the discharges of domestic sewage and trade wastes on the streams is indicated by the sample results listed in Table 8-5.

The nickel, copper, and iron concentrations in the Onaping River-Moose Creek system are significantly increased by the mine water discharges from the Falconbridge Nickel Mines Ltd. and International Nickel Mines of Canada Limited operations tributary to these streams. At times, the bacterial content in the Onaping River below the Town

TABLE 8 - 5

ONAPING IMPROVEMENT DISTRICT - OUTFALL SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | pH AT LAB. | COPPER AS Cu (PPM) | NICKEL AS Ni (PPM) | IRON AS Fe (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SVOMN 113.9 | NORTH BRANCH, MOOSE CR. BELOW STRATHCONA MINE | NOV. 14/62 | 1.2 | 322 | --- | --- | | | 2.8 | 0.65 | 1.7 | 50 |
| SVOMN 112.2-1 | FECUNIS MINE TAILINGS SETTLING TANK EFFLUENT | JUNE 4/63 | 23.0 | 2600 | 2164 | | 6.1 | 1.9 | 6.5 | 88.0 | | |
| SVOMN 112.2S | FECUNIS MINE SANITARY WATER EFFLUENT | NOV. 14/62 | 2.4 | 180 | 34 | 146 | 5.2 | 0.2 | 0.0 | 6.2 | | 10 |
| | | JUNE 4/63 | 2.4 | 172 | 12 | | 4.7 | 0.2 | 0.0 | 1.80 | | 0 |
| SVOMN 112.2-1 | FECUNIS MINE, MINE WATER EFFLUENT | NOV. 14/62 | 1.4 | 114 | | --- | | 0 | 0 | 0.98 | 2.1 | 28 |
| | | JUNE 4/63 | 6.0 | 2538 | 50 | --- | 4.0 | 2.5 | 27.4 | 13.5 | | 0 |
| SVOM 115.8-1 | FECUNIS MINE TAILINGS EFFLUENT | OCT. 6/60 | 4.0 | 708 | 14 | 694 | | 0.2 | 0 | 1.2 | | 10 |
| | | NOV. 14/62 | 3.9 | 576 | 112 | 464 | | 0.1 | - | 7.5 | | 10,000 |
| SVOM 113.0 | MOOSE CR. AT HILLCREST CAMP | NOV. 14/62 | 0.8 | 100 | | | | | | | | 8 |
| | | JUNE 4/63 | 0.9 | 100 | 2 | --- | 3.2 | 0.06 | 0.0 | 5.0 | | 1,800 |
| SVOM 111.4 | MOOSE CR. ABOVE LEVACK MINE OUTLET | MAY /59 | 20 | 252 | 26 | 226 | | | | | | |
| | | JUNE /60 | 1.8 | 200 | 18 | 182 | | | | | | |
| | | NOV. 14/62 | 1.8 | 330 | | | 3.7 | 0.1 | 3.8 | 3.4 | 2.1 | |
| | | NOV. 14/62 | 3.2 | 674 | | | 3.5 | 0.4 | 0 | 1.35 | 3.5 | |
| | | JUNE 4/63 | 1.2 | 718 | 28 | 690 | 3.5 | 1.2 | 10.4 | 8.75 | | 20 |
| SVOGP 109.3-1 | ONAPING MINE WATER DISCHARGE TO GILL POND | NOV. 14/62 | 2.3 | 520 | | | | | | | | |
| | | JUNE 4/63 | 0.4 | 540 | 9 | | 6.5 | 0.08 | 0.0 | 0.60 | | 40 |
| SVO 109.4 | ONAPING R. AT ROAD TO FECUNIS MINE | MAY /59 | 1.1 | 42 | 8 | 34 | 6.5 | | | | | 1,000,000 |
| | | JUNE /60 | 0.7 | 54 | 8 | 46 | | | | | | 1,000 |
| | | OCT. /60 | 4.8 | 100 | | | | | | | | 570 |
| | | AUG. /61 | 1.0 | 84 | | | | | | | | 9 |
| | | AUG. /62 | 1.0 | 156 | | | 5.6 | 0.2 | 0 | 0.69 | | 10 |
| | | NOV. /62 | 4.8 | 144 | | | 5.3 | 0.18 | 3.4 | 1.44 | | 80 |
| | | NOV. /62 | 2.5 | 122 | | | | 0.2 | 3.2 | 1.8 | | 80 |
| | | JUNE 4/63 | 1.4 | 78 | | | | 0 | 2.0 | 0.54 | 1.1 | 5,300 |
| SVO 109.3-1 | HARDY MINE, MINE WATER | NOV. 5/62 | 3.2 | 168 | | 1232 | | 0 | 0 | 1.8 | | |
| | | NOV. 14/62 | 3.2 | 1300 | 68 | | 32 | 0.3 | 3.0 | 10.0 | | 0 |
| | | JUNE 4/63 | 1.4 | 520 | 6 | | 6.8 | 0.04 | 1.0 | 0.50 | | |

of Levack exceeds the OWRC objective of 2400 coliform organisms per 100 ml. Flows in the Onaping River are usually sufficient to maintain the BOD below the recommended 4.0 ppm. level.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

It is recommended that future water demands be satisfied, first, from the available ground-water resources, and secondly, from the Onaping River upstream of Levack or Windy Lake.

V RECOMMENDATIONS FOR POLLUTION CONTROL

Recommendations regarding the waste disposal practices of the mining operations will be outlined in Part II of this report to be issued at a later date.

## RENABIE IMPROVEMENT DISTRICT

I GENERAL

The Renabie Improvement District, located at the north-west corner of the Sudbury District, includes the Townships of Rennie, Leeson, Brackin and Stover. The population is approximately 425, of which approximately 90 per cent live at the Renabie Townsite and Mine. The Renabie Mines Ltd. operates a gold mine at Renabie.

II WATER SUPPLY

1. Source

Water is obtained from Campbell Lake and Renabie Lake.

2. Treatment Works and Water Quality

The Campbell Lake supply is chlorinated and used for drilling and domestic purposes. The portion delivered to the townsite is

treated with alum and passed through a pressure filter with a rated capacity of 50 gpm. The pumping capacity of this supply is 400 gpm.

The Renabie Lake supply, which is used for industrial purposes, is not treated. The pumps, which operate in parallel, have rated capacities of 420 gpm, 480 gpm, and 750 gpm.

The quality of the water is indicated by the results of analyses of samples collected on June 12, 1963.

TABLE 8 - 6

RENABIE IMPROVEMENT DISTRICT - CHEMICAL AND BACTERIOLOGICAL QUALITY

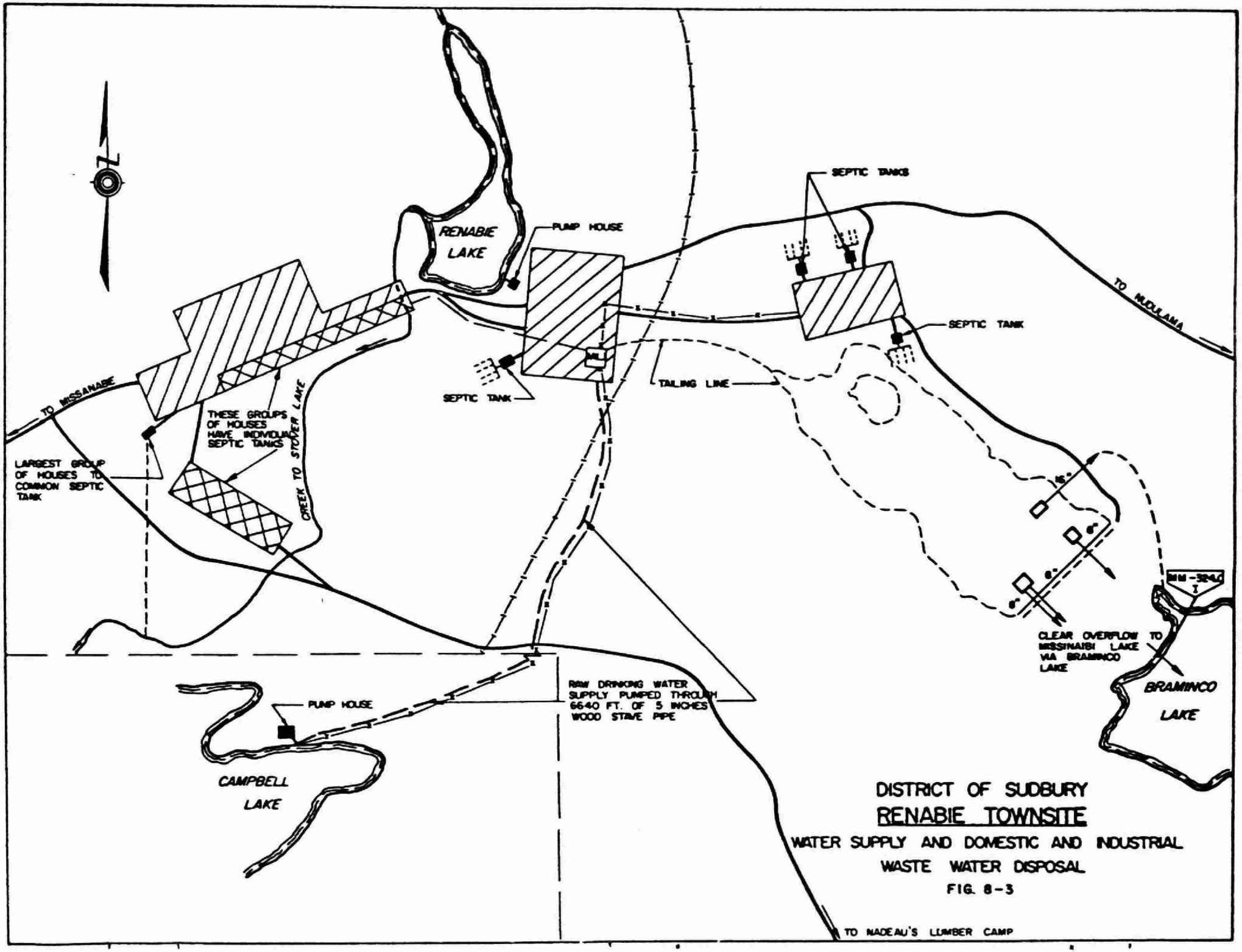
| LOCATION | HARDNESS AS CACO3 (PPM) | ALKALINITY AS CACO3 (PPM) | IRON AS FE (PPM) | CHLORIDE AS CL (PPM) | PH AT LAB. | COLOUR IN HAZEN UNITS | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|
| CAMPBELL LAKE WATER - RAW | 32 | 24 | 0.40 | 1 | 7.2 | 35 | 0.5 | 8 |
| CAMPBELL LAKE WATER - CHLORINATED | - | - | - | - | - | - | - | 0 |
| CAMPBELL LAKE WATER - CHLORINATED AND FILTERED | 26 | 18 | 0.30 | 3 | 6.8 | 25 | 1.1 | - |
| RENABIE LAKE WATER | 70 | 48 | 0.60 | 10 | 7.3 | 110 | 1.8 | 138 |

The quality of the domestic water supply is generally satisfactory although the colour density is in excess of the OWRC objective of 15 Hazen Units.

3. Distribution

The system supplied by Campbell Lake is shown on Figure 8-3. The domestic distribution system is equipped with a 50,000 gallon standpipe and there are approximately 75 services.

The system supplied by Renabie Lake is equipped with a 100,000-gallon elevated tank for fire fighting. The two systems are interconnected.




DISTRICT OF SUDBURY

RENABIE TOWNSITE

WATER SUPPLY AND DOMESTIC AND INDUSTRIAL WASTE WATER DISPOSAL

FIG. 8-3

4. Water Requirements for the Future

The supply is sufficient for present and future demand. System extensions required will depend on increased production at the mine.

It has been previously recommended in OWRC reports that a physical break be made in the cross-connection between the two supplies.

III WATER POLLUTION

1. Sanitary Waste Disposal

(a) Existing Conditions

Domestic sewage is treated by septic tanks which overflow to either field tile systems or to a creek connecting Renabie Lake to Stover Lake. The largest unit receives sewage from approximately 40 homes and overflows to the creek.

(b) Proposed Sewage Works

A sewer system is presently under construction and a sewage lagoon is proposed.

2. Industrial Waste Disposal

The mine processes about 550 tons of ore per day and the tailings are wasted to an area east of the mill. Decanting areas were insufficient to carry the overflow from the tailings area during periods of heavy rain and breaches have occurred in the dam, resulting in the loss of tailings to Braminco Lake. Tailings have also overflowed along the north side, crossed a road and reached Braminco Lake.

A new decant weir with a 16" overflow is now under construction to relieve the overflow during periods of heavy run-off and to allow the bank of the dam to remain dry. Two older decant weirs, one with two 8-inch outfalls and one with one 8-inch outfall carry the normal overflow.

An average of 50 to 75 tons per day of waste rock is produced from the mine and since the very fine tailings from this mill(72 per cent under 200 mesh) do not provide a stable dam, it is recommended that this waste rock be used to reinforce the tailings dam along with sand or gravel.

TABLE 8 - 7

RENABIE IMPROVEMENT DISTRICT - STREAM AND OUTFALL SAMPLES

| LOCATION | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|
| RENABIE LAKE AT INDUSTRIAL WATER WORKS INTAKE | 1.5 | | | | 1.8 | 138 |
| MAIN SEPTIC TANK OUTFALL TO STOVER CREEK | 61.0 | 222 | 33 | 189 | | 1,300,000 |
| STOVER CREEK BELOW TOWNSITE AT ROAD TO NADEAU LUMBER CAMP | 1.4 | 172 | 25 | 147 | | 5,600 |
| FROM CENTER DECANT WEIR TAILINGS POND-RENABIE MINES LTD. (MM324.0-1) | | 1044 | 772 | 272 | | |

The results of additional analyses on sample #4 are recorded below.

| CYANIDE AS HCN (PPM) | ARSENIC AS As (PPM) | COPPER AS Cu (PPM) | LEAD AS Pb (PPM) | IRON AS Fe (PPM) | pH AT LAB. | ALKALINITY AS CaCO3 (PPM) | HARDNESS AS CaCO3 (PPM) |
|---|---|---|---|---|---|---|---|
| 5.0 | 0.0 | 0.32 | LESS THAN 1 | 6.65 | 9.0 | 110 | 116 |

NOTE - FILTERED SAMPLES

Attention is directed to the high BOD and coliform count of the main septic tank outfall, indicating inadequate sewage treatment. The concentration of coliform organisms in Stover Creek below the townsite exceeds the OWRC objective of a maximum of 2400 per 100 ml.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

A physical break should be made in the existing cross connection between the two water systems.

V RECOMMENDATIONS FOR POLLUTION CONTROL

The proposed lagoon should be constructed at an early date. As outlined in the discussion on industrial waste, the tailings dam should be reinforced.

# CHAPTER NINE

## TOWNSHIPS(UNORGANIZED)

TOWNSHIPS OF CREIGHTON & SNIDER



TOWNSHIP OF CURTIN



TOWNSHIP OF DRYDEN

TOWNSHIP OF FOLEYET — PAGE NO.



TOWNSHIP OF HUTTON



TOWNSHIP OF LAURA

TOWNSHIP OF LEVACK



TOWNSHIP OF NOBLE

# CHAPTER 9 - TOWNSHIPS (UNORGANIZED)

## INTRODUCTION

The unorganized townships, which are generally sparsely populated, comprise approximately 96 per cent of the total acreage of the District of Sudbury. The population is mainly centered near the major transportation routes. Although the Canadian National and the Canadian Pacific Railway Co. have rail lines traversing the District of Sudbury, many townships are inaccessible other than by aeroplane or canoe.

There are approximately twenty-five pulp camps in the District of Sudbury. The sanitary conditions at these camps are supervised by the Ontario Department of Health, Industrial Hygiene Branch.

A complete coverage of each of the unorganized townships is considered unnecessary at this time, but the more developed ones are included in this chapter. As a community grows, the need for organization becomes increasingly apparent, to cope with the problems that can best be resolved by community effort. Without municipal organization, remedial action or improvements to existing conditions can only be obtained by individual action.

## TOWNSHIP OF BRODER

### I GENERAL

The unorganized Township of Broder lies immediately south of the City of Sudbury. Ribbon development exists along Highway #69

around McFarlane Lake and in the Burmac, Veteran's Land Act, Subdivision.

Considerable summer cottage and home construction is occurring along both north and south shores of Long Lake.

II WATER SUPPLY

A communal water supply serves the Ontario Government complex on McFarlane Lake, and the VLA Subdivision. Water is drawn from McFarlane Lake and chlorinated prior to discharge to a 160,000-gallon ground level reservoir. The water supply for the Department of Highways, Department of Works and Provincial Police buildings is rechlorinated at the discharge side of the high lift pumps. Under agreement with the Director of the Veteran's Land Act, a separate pumping system draws water from the reservoir to serve the 30 homes in Burmac Subdivision without further treatment. The intake limits the total capacity of the system to 70,000 gpd.

The chemical quality of the treated water is indicated by the following analyses.

TABLE 9 - I

TOWNSHIP OF BRODER - McFARLANE LAKE - CHEMICAL WATER QUALITY

| DATE | HARDNESS AS CACO3 (PPM) | ALKALINITY AS CACO3 (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | pH AT LAB. |
|---|---|---|---|---|---|
| MAY 18, 1962 | 64 | 20 | 0.22 | 11 | 8.0 |

The supply provides an excellent source of potable water. Routine tests indicate that the bacterial quality of the treated water is satisfactory.

The present system should be adequate to meet the needs of future expansion of the government development and the ultimate development of the subdivision to 40 homes.

As the population around McFarlane Lake increases, more refined treatment may be deemed necessary.

A large number of private homes obtain water from small diameter drilled wells terminating in the rock below silt and sand beds. In the plains areas near McFarlane Lake in Lots 4,5,6 and 7 of Concessions V and VI a few drilled wells produce good quantities of fresh water from sand and gravel deposits at depths of 70 to 132 feet.

Large diameter dug wells in the Burmac and Henri Subdivisions in Concession V, Lot 1, yielded unsatisfactory water supplies due to the extensive silt deposits in the community. A few wells were drilled in the community but most did not yield satisfactory supply.

Water supply for the cottages and homes around Long Lake is from private well supplies or lake intakes.

III WATER POLLUTION

1. Sanitary Waste Disposal

The sanitary wastes from the Ontario Government development flow to a mechanically aerated,activated sludge sewage treatment plant. The effluent is chlorinated and discharged to McFarlane Lake approximately one mile from the water works intake. The system is designed to serve 250 persons with a per capita sewage

flow of 100 gpd.

Presently, the plant serves approximately 75 persons. The efficiency of the treatment provided is indicated by results of composite samples.

TABLE 9 - 2

TOWNSHIP OF BRODER - 1962 SAMPLE RESULTS - DPW SEWAGE TREATMENT PLANT EFFICIENCY

| | | BOD | SUSPENDED SOLIDS |
|---|---|---|---|
| RAW SEWAGE | PPM | 45 | 50 |
| FINAL EFFLUENT | PPM | 20 | 22 |
| EFFICIENCY | % | 55 | 56 |

The efficiency of treatment is compromised by a weak raw sewage and the intermittent nature of the flows to the plant.

Sewage disposal in the VLA subdivision is provided by individual private septic tank and tile bed systems. Installation of private sewage systems is supervised by the Sudbury and District Health Unit.

Private septic tank systems and pit privies serve the development around Long Lake. During 1962 the Health Unit performed a sampling survey which indicated that the coliform concentration in the lake was unsatisfactory.

A similar survey during 1963 has indicated that conditions are somewhat improved.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

Protection of the water quality of Long Lake should be

provided by installation of suitable septic tank and tile bed disposal systems.

## TOWNSHIP OF BURWASH

### I GENERAL

The Burwash Industrial Farm is discussed under Laura Township. The main centre of population in the unorganized Township of Burwash is concentrated at the community of Estaire, about 17 miles south of Sudbury. The community of Estaire comprises about 35 homes, one motel and three service stations, in addition to a church and a school.

### II WATER SUPPLY

Many of the residents at Estaire draw water by the pail from an overflowing drilled well which is approximately 150 feet deep. There are also other private wells in the community. The four drilled wells for which records are available produce adequate quantities of water (from the bedrock) for domestic and commercial requirements.

### III WATER POLLUTION

Pit privies are generally employed in this community. There are no apparent pollution problems.

The results of sanitary chemical and bacteriological analyses of the water from Estaire Creek were found acceptable, in relation to the objectives for stream sanitation. These results are recorded in Table 9-3.

TABLE 9 - 3

TOWNSHIP OF BURWASH (ESTAIRE) - STREAM SAMPLES

| SAMPLING POINT NO. | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORM COUNT/100 ML. |
|---|---|---|---|---|
| FWT 39.4 | 1.5 | 152 | 3.1 | 180 |

## IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations in this regard at this time.

## V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations in this regard at this time.

## TOWNSHIP OF CARTIER

### I GENERAL

Cartier Township is located approximately thirty miles north-west of Sudbury and is diagonally bisected by the Canadian Pacific Railway Co. main line. The only population centre is the community of Cartier located along the railway, eleven miles from the Town of Levack. The population of Cartier is approximately 1,000.

It is expected that the community of Cartier will continue to be an important railway centre. Forest product industries are expected to develop in the area.

### II WATER SUPPLY

Almost all of the buildings in Cartier are served by shallow private wells which generally exhibit satisfactory bacterial quality.

Oil seepage from CPR diesel oil storage and refuelling operations contaminated private well supplies in the Cartier area (see discussion on industrial waste disposal).

A privately-owned water works system serves the CPR buildings and twenty-five residences. Water is obtained from Clear Lake. Two service pumps each rated at 500 gpm are available. Treatment consists of chlorination. Storage is provided by a 60,000-gallon elevated tank.

The results of chemical analyses performed on a water sample from Clear Lake are as follows:

TABLE 9 - 4

TOWNSHIP OF CARTIER - CLEAR LAKE - CHEMICAL WATER QUALITY

| DATE | HARDNESS AS CaCO3 (PPM) | ALKALINITY AS CaCO3 (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | pH AT LAB. | TURBIDITY IN SILICA UNITS | COLOUR IN HAZEN UNITS |
|---|---|---|---|---|---|---|---|
| Nov. 5/62 | 44 | TRACE | 0.10 | 6 | 7.1 | 1.4 | 20 |

The water is highly coloured, very soft and possesses aggressive tendencies.

Expansion in Cartier is not anticipated in the near future. Oil pollution of the private well supplies to the south-west of the railway tracks indicates the susceptibility of the shallow well supplies to surface contamination. A municipal water works system would be desirable to insure a bacteriologically and chemically satisfactory water supply.

Extension of the private CPR system to serve the remainder of the community would constitute an adequate supply. However, more refined treatment would be desirable.

As little is known about the ground-water characteristics of the sand and gravel deposits at Cartier, a ground-water exploration program would be needed to test the yield and water quality of the aquifer. Several small lakes in the area would also constitute adequate surface water sources for a municipal water works.

III WATER POLLUTION

1. Sanitary Waste Disposal

Methods of domestic sewage disposal include private septic tank installations, cesspools and privies. As the community is situated on gravelly terrain these systems function properly.

2. Industrial Waste Disposal

Pollution of surrounding wells and a small watercourse has occurred due to losses of diesel oil during draw-down of condensate to the ground from a 550,000-gallon oil storage tank and also due to losses of diesel oil when engine tanks are overfilled at the CPR yards at Cartier.

The divisional engineer has arranged to drain all condensate from the storage tank to a tank truck for disposal at a dump and to modify all diesel engine spouts and the filling nozzles to provide automatic shut-off when the tank is full. The collection of condensate is now in effect and modifications to all diesel

engines in the division and to the nozzles are to be completed by November 1, 1963.

3. Surface Water Quality

Samples obtained on June 5, 1963, from Pumphouse Creek upstream and downstream from the community of Cartier, and from Depple Lake to the south-west indicate oil pollution. Phenol concentrations in the range of 10 to 20 ppb. were determined at the above locations. Oily material collected from the CPR yard drain was examined by infrared spectrometry which indicated a composition similar to diesel fuel oil.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

Consideration be given to the development of a communal water works system or the extension of the CPR supply to serve the residents of Cartier.

V RECOMMENDATIONS FOR POLLUTION CONTROL

The necessary measures be taken by the CPR to avoid the pollution of ground and surface waters.

## TOWNSHIPS OF CREIGHTON AND SNIDER

I GENERAL

The Creighton Mine, Mill and Townsite are located in the unorganized Townships of Creighton and Snider, about 8.5 miles west of Copper Cliff. The mine and the mill are owned and operated by INCO.

II WATER SUPPLY

1. Source

Two sources of supply serve the Creighton Mine, Mill and Townsite. The Meatbird Lake supply which draws approximately 1.5 mgd, is used primarily for the townsite and the mine. The Vermilion River supply is primarily for industrial use, but this water is also used for sanitary and domestic purposes at the mill and the change house. The pumpage rate is approximately 6 mgd.

The water works system at the Giant Yellowknife Mine is still in use and serves residents in Balfour Township. For details of this system refer to the section in Balfour Township, Chapter 7.

2. Treatment Works and Water Quality

Chlorination by means of gas chlorinators is provided for both water works systems. Samples from each system were analyzed on May 30, 1962. The chemical analyses results are recorded below.

TABLE 9 - 5

TOWNSHIP OF CREIGHTON - WATER SUPPLY - CHEMICAL QUALITY

| SOURCE | HARDNESS AS CACO3 (PPM) | ALKALINITY AS CACO3 (PPM) | ACIDITY AS CACO3 (PPM) | IRON AS FE (PPM) | CHLORIDE AS CL (PPM) | TURBIDITY IN SILICA UNITS | pH AT LAB. | COLOUR IN HAZEN UNITS | COPPER AS CU (PPM) | NICKEL AS NI (PPM) |
|---|---|---|---|---|---|---|---|---|---|---|
| MEATBIRD L. | 160 | - | 40 | .38 | 11 | 1.8 | 4.2 | < 5 | .56 | 8.5 |
| VERMILION R. | 56 | 18 | | .55 | 2 | 3.6 | 7.3 | 30 | .06 | 0 |

The water from Meatbird Lake was acidic and contained a significant concentration of nickel. The water from the Vermilion

River was soft, slightly alkaline, and had a colour considerably in excess of the maximum recommended value of 15 Hazen Units. Both supplies contained iron in excess of the recommended maximum of 0.3 ppm. Approximately twenty bacteriological samples are collected each month at Creighton and in the past, the examinations have indicated that the water was free of coliform contamination.

3. Distribution

Elevated storage is provided at the Creighton Townsite by a 230,000-gallon standpipe. All homes at the townsite are served by the Meatbird Lake supply which is interconnected with Vermilion River supply.

4. Water Requirements for the Future

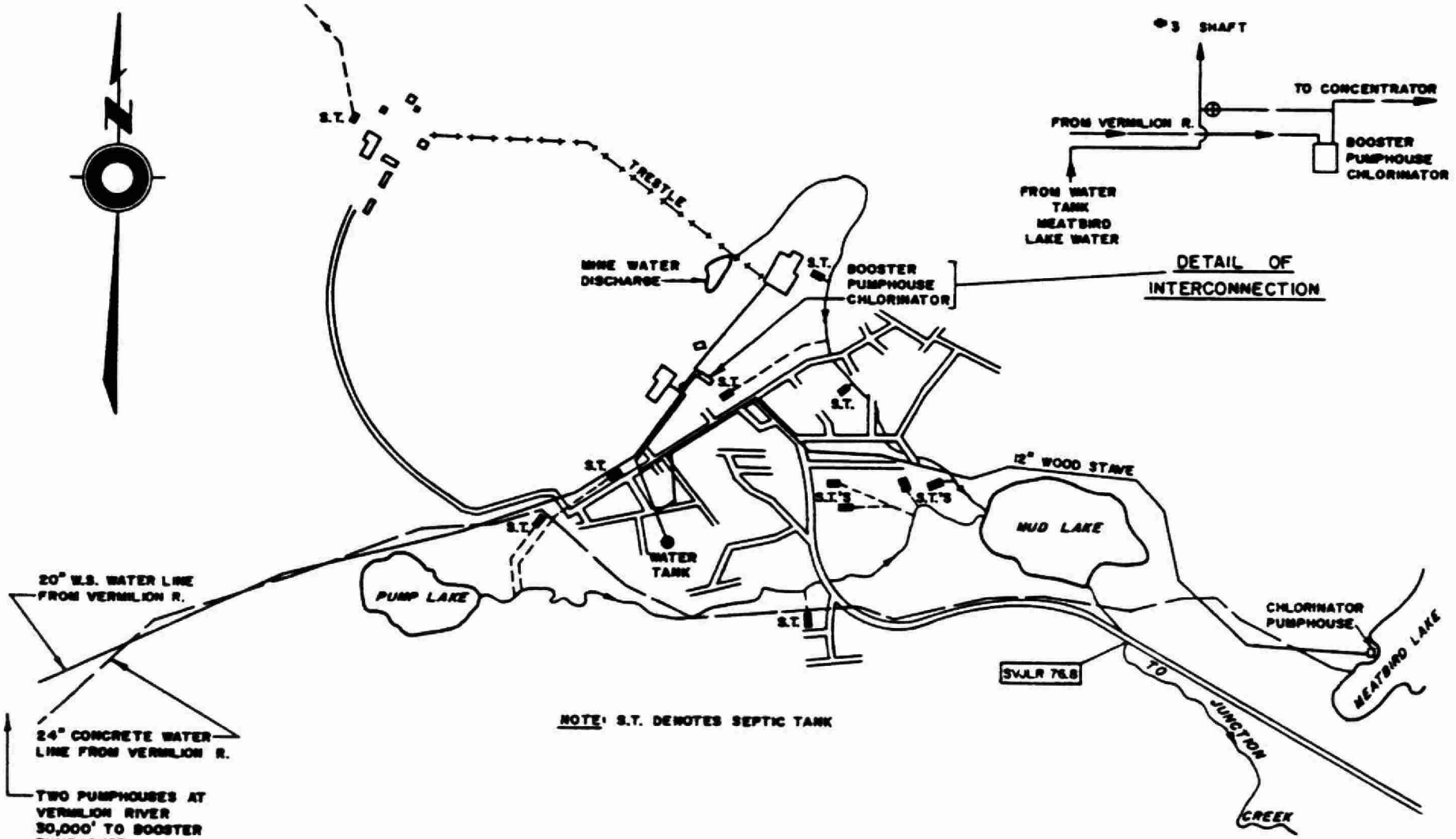
The augmented supplies from the Vermilion River will ensure the abundant provision of water at Creighton, for years to come.

III WATER POLLUTION

1. Sanitary Waste Disposal

Septic tank effluents from the No.3 shaft, No.7 shaft and from the townsite are discharged to a watercourse tributary to Mud Lake, on the Junction Creek Watershed. The septic tank effluent from the No.5 shaft is discharged to a watercourse tributary to the Whitewater Lake.

INCO has commenced preliminary studies relative to the collection of the various septic tank effluents, preparatory to initiating sewage disposal works. The present numerous sewage disposal systems are inadequate and exert a considerable pollution




## LEGEND

SVJLR 76.8 – SAMPLING POINT SHOWING STREAM AND MILEAGE

FIG. 9-1

| ONTARIO WATER RESOURCES COMMISSION | |
|---|---|
| CREIGHTON MINE AND TOWNSITE<br>WATER SUPPLY & WASTE WATER DISPOSAL<br>SEPTIC TANKS AND DISCHARGES | |
| SCALE: 4" = 1 MILE | |
| DRAWN BY: A.R.S. | DATE: MAY, 1963 |
| CHECKED BY: | DRAWING No: 63-164 |

load on the receiving watercourses. Sewage treatment, to reduce the strength of these wastes before discharge, is required. The waste stabilization pond has been used effectively for the purpose and has proved most suitable where land costs are low.

2. Industrial Waste Disposal

In the Township of Creighton, the Giant Yellowknife Mines Limited operates a mine for which Falconbridge Nickel Mines Ltd. holds a major portion of the shares. This mine has been closed.

At the Creighton Mine and Mill employment is provided for 2,140 persons, about 100 of whom work in the surface operations and the remainder in mining operations. Approximately 510 U.S. gpm is pumped from the mine as mine waste water. This water is discharged to Mud Lake via an open channel. Milling and flotation tailings are pumped to the Copper Cliff tailings disposal area, after partial recovery of rake sand for mine fill. The volume of tailings is about 1820 U.S. gpm.

3. Surface Water Quality

Septic tank overflows, mine and mill waste waters, and the overflow from Mud Lake, have been sampled and the results are recorded in Table 9-6.

Excessive concentrations of BOD and suspended solids are being discharged from the septic tanks. Samples of the stream draining Mud Lake(SVJLR 76.8) were acidic and contained values of copper and nickel much in excess of the concentrations found toxic to fish. These conditions can be attributed to industrial waste discharges from the Creighton Mine and Mill operation.

TABLE 9 - 6

TOWNSHIPS OF CREIGHTON & SNIDER - OUTFALL & STREAM ANALYSES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | PH AT LAB. | COPPER AS Cu (PPM) | NICKEL AS Ni (PPM) | IRON AS Fe (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SVJLR77.3-S(4) | WAVELL ST. SEPTIC TANK | OCT. 27/60 | 315 | 870 | 146 | 724 | 6.09 | | | 2.3 | | |
| SVJLR77.3-S(2) | GEORGE ST. SEPTIC TANK | DEC. 15/60 | 25 | 470 | 52 | 418 | 6.3 | | | | | 30 |
| SVJLR77.3-S(3) | LAKE ST. SEPTIC TANK | DEC. 15/60 | 345 | 1012 | 298 | 714 | 6.8 | | | | | 1,700,000 |
| SVJLR77.3-S(1) | CONNAUGHT ST. SEPTIC TANK | DEC. 15/60 | 255 | 842 | 166 | 676 | 7.0 | | | | | 900,000 |
| | MINE #3 SHAFT | DEC. 15/60 | 36 | 360 | 96 | 264 | 6.7 | 1.55 | 11 | 1.48 | | 47 |
| SVJLR77.2-S(5) | CREIGHTON MILL | DEC. 15/60 | 13 | 280 | 46 | 234 | 6.0 | 0.45 | 4.5 | 6.8 | | 0 |
| SVJLR77.2-1 | MINE WASTE | DEC. 15/60 | 14 | 2728 | 78 | 2650 | 4.5 | 3.8 | 190 | 1014 | | - |
| SVJLR76.8 | CREIGHTON CR. AT HWY. #536 | DEC. 15/60 | 6.4 | 936 | 38 | 898 | 4.4 | 6.0 | 51.0 | 1.2 | | 0 |
| | | JUNE 27/60 | 1.2 | | | | | | | | 5.0 | 0 |
| " | " " | AUG. 16/61 | 1.8 | 846 | 34 | 812 | 4.9 | 1.48 | 25.8 | 0.44 | | 0 |
| " | " " | AUG. 1/62 | 1.2 | 1138 | | | 4.4 | 0.84 | | 0.68 | 6.5 | 1,200 |
| " | " " | JUNE 3/63 | 1.5 | 832 | | | 4.6 | 2.1 | 28 | 0.0 | 3.6 | 26 |

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

Consideration should be given to the provision of improved sewage disposal facilities, such as afforded by a sewage stabilization lagoon.

Recommendations regarding industrial waste disposal will be given in Part II of this report to be issued at a later date.

## TOWNSHIP OF CURTIN

I GENERAL

Curtin Township is located in the south-western part of the District of Sudbury. The township population is concentrated mainly at the communities of Willisville and Whitefish Falls. The community of Willisville provides housing accommodation for the work force at Lawson Quarry which is owned and operated by INCO. Of the twenty-six housing units at Willisville, only nineteen are occupied. Approximately 35 persons are employed at the quarry.

The population of Whitefish Falls is approximately 200.

II WATER SUPPLY

The hotel, the restaurant, the lodge and the school at Whitefish Falls are served by private water works systems, obtaining water from the river. These supplies are hypochlorinated. Other residents of the community obtain water either from wells or pail quantities drawn from the river.

The water supply for Willisville is drawn from Frood Lake on the Lake Panache system. Water is drawn from a 4-inch intake and pumped by a 1,000 U.S. gph pump into the distribution system. A hypochlorinator is provided for this system. Of the 24,000 gpd pumped, about 5,000 gallons are used and the remainder is returned to the lake.

The water supply for the Lawson Quarry is also obtained from Frood Lake. This water is hypochlorinated and delivered to the quarry by means of a 260 U.S. gpm pump. Of the one million gallons of water pumped daily, about 5,000 gallons are used and the remainder is available for fire supply but is normally returned to the lake.

There have not been sufficient samples collected of the treated water to determine the general effectiveness of the chlorination practices. The raw water quality is indicated by the following analyses.

TABLE 9 - 7

TOWNSHIP OF CURTIN - FROOD LAKE - WATER QUALITY

| LOCATION | 5-DAY BOD (PPM) | HARDNESS AS CACO3 (PPM) | ALKALINITY AS CACO3 (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | pH AT LAB. | COLOUR IN HAZEN UNITS | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|
| LAKE RAW WATER - WILLISVILLE | | 30 | 10 | 0.2 | 3 | 6.8 | < 5 | 1.4 | 0 |
| LAKE RAW WATER - LAWSON QUARRY | 1.0 | 30 | 10 | 0.2 | 3 | 6.8 | 5 | 1.0 | 27 |

## III WATER POLLUTION

At Whitefish Falls, sewage disposal is achieved on an individual basis. Pit privies are commonly used but there are

some septic tank systems installed.

Sanitary sewage from Willisville is collected and discharged to a septic tank which overflows to four leaching wells. The sewage system was designed to serve 150 persons. The leaching wells drain to the lake about 500 feet downstream from the water works intake.

Sanitary sewage from the quarry is collected and discharged to a septic tank designed to serve one hundred persons. The tank discharges to a filter bed and to Frood Lake. No industrial waste problems are anticipated in regard to the mining of quartzite at the Lawson Quarry.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

It is recommended that effluent from the leaching wells or the filter bed be prevented from gaining access to Frood Lake.

## TOWNSHIP OF DRYDEN

I GENERAL

The unorganized Township of Dryden is situated east of the City of Sudbury and is bisected by Highway #17. The main centre of population in the township is concentrated at the hamlet of Wanapitei. There are no major industries at Wanapitei and the community is essentially residential. The development has been localized in three distinct areas. The total population is

approximately 400. The community could develop rapidly as it is located on a main highway near the City of Sudbury.

II WATER SUPPLY

1. Source

Private shallow dug wells provide most of the water in the community of Wanapitei. The dug wells are approximately 20 feet deep, though one is 55 feet deep. A number of these wells are contaminated as indicated by a survey undertaken by the Sudbury and District Health Unit. No drilled wells were reported at Wanapitei proper, although there are a number of drilled wells at Upper Wanapitei. One well, drilled at the Department of Highways garage - Lot 10, Concession III, produces water from a gravel horizon at a depth of 170 to 187 feet. This gravel was deposited in the Wanapitei River Valley.

A water association, formed by eleven home owners, own and operate a water works system drawing water from the Wanapitei River.

A number of residences, two schools and a church obtain Wanapitei River water from private intakes. The river water is chlorinated only by the schools and one resident.

The chemical quality of the Wanapitei River was determined from a sample collected at the Highway #17 bridge on June 4, 1963. The results are recorded in Table 9-8. The water is soft and displays an acidic pH. The iron concentration exceeds the OWRC objective of 0.3 ppm.

TABLE 9 - 8

TOWNSHIP OF DRYDEN - WANAPITEI RIVER - WATER QUALITY

| HARDNESS AS CaCO3 (PPM) | ALKALINITY AS CaCO3 (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | pH AT LAB. | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|
| 80 | 8 | 0.9 | 4 | 6.1 | 2.8 | 38 |

2. Potential Additional Water Supplies

The water table is exposed in a small gravel pit south of Highway #17 on the west side of the Wanapitei River. It is probable that a good supply of water could be obtained from this source. The gravel encountered at depth in the Department of Highways well, also suggests the likelihood of encountering a good aquifer in this area. On the east side of the river opposite the gravel pit there are extensive deposits of fluvial sands and silts which may be underlain by coarser material along a former channel of the river. The area has moderate chances of producing a sizeable ground-water supply.

North of Highway #17 the chances of finding good quantities of ground water are poor as the topography is marked by many bedrock hills with small valleys and basins filled with sand and silt. Gravels of limited extent are present on the hillside or in small valley pockets, but offer little encouragement for ground water.

## III WATER POLLUTION

### 1. Sanitary Waste Disposal

The older section of Wanapitei located north of Highway #17 and west of the river, is the source of most of the domestic sewage pollution in the vicinity. The building lots are generally small and the tile beds or leaching wells are unable to retain all of the septic tank effluent, resulting in pollution of the road ditches.

The unorganized Township of Dryden is included within the coverage of the Sudbury and District Health Unit. Accordingly, this agency has supervisory control of the private sewage disposal facilities.

### 2. Surface Water Quality

Samples of the Wanapitei River in Dryden Township were collected on June 4, 1963, and the results of the analyses met the OWRC objective for surface water quality. These sample results are recorded below.

TABLE 9 - 9

TOWNSHIP OF DRYDEN - STREAM SAMPLES

| LOCATION | 5-DAY BOD (PPM) | TOTAL SOLIDS (PPM) | TURBIDITY IN SILICA (PPM) | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|
| WANAPITEI R. AT POWER DAM | 0.8 | 120 | 30 | 2.5 |
| WANAPITEI R. AT HWY.#17 AT WANAPITEI | 0.8 | 174 | 38 | 2.8 |
| WANAPITEI R. AT DAM, TIMMINS CHUTE | 0.5 | 80 | 4 | 1.3 |

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

It is recommended that a community water works system be established to serve the residences presently using contaminated well water.

V RECOMMENDATIONS FOR POLLUTION CONTROL

It is recommended that action be taken by the offending individuals or by the community, to prevent the discharge of sewage to the road ditches or the river.

## TOWNSHIP OF FOLEYET

I GENERAL

The unorganized Township of Foleyet is located near the northern extremity of the District of Sudbury. About 650 persons reside at the community of Foleyet.

II WATER SUPPLY

The water works system operated by the Canadian National serves approximately one-half of the residents of the townsite. The remainder of the residents depend upon sand points or dug wells, for water supplies.

The CN water works system draws water from the Ivanhoe River. Chlorination is provided by means of a hypochlorinator. Storage is provided by a 61,000 gallon elevated tank and the two high lift pumps are each rated at 100 gpm. The distribution system is comprised of 2-inch mains and the pressure at elevated locations and at the extremities of the system is quite low.

Precise data is not available at present in regard to the aquifer characteristics of the sand and gravel deposits in the Foleyet area. This information could only be provided by a ground water exploration program.

III WATER POLLUTION

Sewage disposal is accomplished on an individual basis. The river water quality has been found satisfactory and there is no evidence that the community of Foleyet is polluting the stream.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

Consideration should be given to the development of a community owned water works system.

V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations at this time.

## TOWNSHIP OF HUTTON

I GENERAL

The Lowphos Ore Limited, Moose Mountain Mine, is located in the unorganized Township of Hutton at Sellwood, about twelve miles north of the Town of Capreol. The company is engaged in open pit mining of low grade iron ore.

II WATER SUPPLY

There are two sources from which water may be drawn for domestic or sanitary purposes. One source is a dug well 28-feet in depth and 4-feet in diameter. The water depth is approximately 8-feet and the well pumps have rated capacities of 10 gpm and 18 gpm. These pumps

discharge to a reservoir at the pumphouse. The water is hypochlorinated and pumped into the distribution system. The high lift pump and the standby pump, each have a capacity of 200 gpm.

When the well supply is inadequate, water is taken from the industrial water supply which is obtained from the Roberts River. Treatment of this water includes coagulation with alum and soda ash, pressure filtration through sand and gravel filters and charcoal filters, and hypochlorination. A bacteriological sample of the treated water was collected on June 5, 1963, and the results of the examination indicated the water to be of satisfactory quality.

III WATER POLLUTION

1. Sanitary Waste Disposal

Sanitary sewage is collected in a sump, chlorinated, and pumped to a hollow in a gravel bed, about 200 to 300 feet from the river. The liquid seeps away and there is no surface flow from the hollow.

2. Industrial Waste Disposal

Open pit mining operations produce 120,000 tons of crude ore per month under normal operating conditions and from this ore approximately 50,000 tons of iron ore concentrate is produced each month. The company is presently installing a pelletizing plant and when this plant is complete the company will employ approximately 235 persons and operate seven days per week, 24 hours per day. Operations at the plant will include crushing, milling, magnetic separation, hydro separation, filtering and pelletizing.

The water necessary to maintain the above operations is supplied by the Roberts River. Since the industrial water system is a closed circuit, the only industrial water necessary is make-up water and this is supplied at a rate of approximately 1500 to 3000 gpm. The industrial waste circulated in the closed system amounts to 13,000 to 14,000 gpm. This water is added, starting at the rod mills, to act as a carrier for the pulverized ore. When the pelletizing plant is operating, treated water will be used to cool the chunk breakers. This water will in turn be passed through a heat exchanger to be cooled by untreated industrial water. It is not expected that the pelletizing plant will require an unusual amount of water.

All industrial wastes from the plant are discharged to a series of four tailings ponds where the tailings are allowed to settle. These ponds cover an area of approximately 300 acres. The clear supernatant from the ponds is re-used. The only possible chance of having an outfall from the tailings area occurs under abnormal conditions such as plant shut-down. At such times, it is possible that the capacity of the tailings area will not accommodate the water from drained lines and equipment.

3. Stream Water Quality

A sample of the Roberts River below the Lowphos Ore Mine was collected on June 3, 1963. The water quality meets the OWRC objective for stream sanitation. The following results were obtained.

TABLE 9 - 10

TOWNSHIP OF HUTTON - ROBERTS RIVER - SANITARY QUALITY

| 5-DAY BOD (PPM) | pH AT LAB. | TOTAL SOLIDS (PPM) | IRON AS Fe (PPM) | TURBIDITY IN SILICA UNITS | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|
| 0.7 | 6.8 | 38 | 0.42 | 3.1 | 16 |

## IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations at this time.

## V RECOMMENDATIONS FOR POLLUTION CONTROL

The industrial waste disposal practices of the Lowphos Ore Company Ltd. appear to be adequate. However, the tailings disposal area should be checked at regular intervals to insure that complete impoundment of these wastes is maintained.

# TOWNSHIP OF LAURA

## I GENERAL

The unorganized Township of Laura, consists entirely of the Burwash Industrial Farm which is under the supervision of the Department of Reform Institutions of the Ontario Government. It is located approximately 20 miles south of Sudbury within the Wanapitei River drainage basin.

Three camps, namely Camp Spruce, Camp Bison, and Camp Two (Main Camp) constitute the industrial farm communities. Camp Spruce on Highway #69 has from 100 to 125 inmates and 12 guards. Camp Two is situated approximately three miles west of Highway #69 near the CN line and consists of the main cell block and

administration building holding 600 to 700 inmates, and the settlement of Burwash with its population of 1000 prison officials and families. The Camp Bison cell block, with a capacity of 250 inmates, is situated three miles to the south-west of the Main Camp near the Wanapitei River.

II WATER SUPPLY

1. Source

Camp Spruce obtains water from a spring which discharges water directly to the reservoir at the pumphouse.

The water supplies at Camp Two and Camp Bison derive water from the Wanapitei River. A deep well is also available at Camp Two as a standby supply.

2. Treatment Works and Water Quality

Chlorination is the only treatment provided the water at Camp Spruce. The rated capacity of the pump is 80 gpm. The system capacity during the summer is limited by the quantity of spring water, which diminishes to the point where water haulage is necessary during dry periods.

At Camp Two, treatment consists of coagulation for turbidity removal, soda ash treatment for pH control, pressure filtration and gas chlorination. The well water receives no treatment. The river supply has a limited pump capacity of approximately 250 gpm and the deep well capacity is 300 gpm. Presently, the average daily pumpage is approximately 250,000 gpd.

The water supply for Camp Bison receives gas chlorination and pressure filtration. The rated pump capacity is 0.144 mgd.

The chemical quality of the three supplies is indicated by the analyses listed in the following table.

TABLE 9 - 11

TOWNSHIP OF LAURA - BURWASH INDUSTRIAL FARM - WATER SUPPLY - CHEMICAL QUALITY

| LOCATION | DATE | HARDNESS AS CaCO3 (PPM) | ALKALINITY AS CaCO3 (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | pH AT LAB. | COLOUR IN HAZEN UNITS | TURBIDITY IN SILICA UNITS |
|---|---|---|---|---|---|---|---|---|
| CAMP TWO - WANAPITEI R. (TREATED) | NOV. 7/62 | 74 | 18 | 0.54 | 8 | 7.8 | 20 | 2.9 |
| CAMP TWO - WELL SUPPLY | MAY 15/62 | 144 | 124 | 0.43 | 4.0 | 6.8 | | |
| CAMP BISON - WANAPITEI R. (TREATED) | NOV. 7/62 | 64 | 14 | 0.27 | 12 | 7.5 | 20 | 2.1 |
| CAMP SPRUCE-SPRING | MAY 15/62 | 96 | 60 | 0.22 | TRACE | 7.1 | | |

The water supplies from the Wanapitei River exhibit high colour and fluctuating turbidities particularly during spring run-off months. The iron contents of the river water at times exceed the 0.3 ppm. limit. The iron content of the deep well supply at Camp Two is above the recommended limit and is hard.

The water supplies at all three camps are bacteriologically satisfactory after treatment.

3. Distribution

Storage at Camp Two consists of a 47,000-gallon elevated tank. Services are provided to approximately 150 residences, the main cell block, administration building and various farm workshops and barns.

A 900-gallon hydro-pneumatic pressure tank provides storage at Camp Spruce. Only the main building, housing the inmates and guards, is serviced.

4. Water Requirements for the Future

Some growth is occurring at the industrial farm but the population is relatively static in comparison with the remainder of the Sudbury area. Water supply at Camp Two and Camp Bison is not critical as adequate quantities are available from the Wanapitei River to meet anticipated future expansion.

Consideration is presently being given to utilizing ground-water sources or to providing more refined water treatment at Camp Two.

5. Potential Additional Water Supplies

No detailed studies of ground-water resources have been made. The only wells drilled to date are a well at Camp Spruce and a well at Camp Two. The yield of the former well is small. The latter well was sunk in August of 1957 and presently serves as a standby source of water. The hardness of this water is in the order of 120 parts per million, and the quantity is ample. Adequate quantities of water are available from the Wanapitei River. Complete treatment facilities would need to be employed.

III WATER POLLUTION

1. Sanitary Waste Disposal

(a) Existing Conditions

Sewage from Camp Two discharges to a 250,000 gpd.mechanically aerated, activated sludge sewage treatment plant. The chlorinated

effluent discharges to a small pond, below Neilly Lake. Presently, the average daily flow is approximately 114,000 gpd. The basic treatment efficiency calculated from recent composite samples is indicated in the following table.

TABLE 9 - 12

TOWNSHIP OF LAURA - COMPOSITE SAMPLE RESULTS CAMP TWO - S.T.P.

| | | BOD | SUSPENDED SOLIDS |
|---|---|---|---|
| RAW SEWAGE | PPM | 208 | 199 |
| FINAL EFFLUENT | PPM | 11.4 | 24.6 |
| EFFICIENCY | % | 95 | 87 |

The BOD removal is satisfactory but the suspended solids exceeds the OWRC objective of 15 ppm.

Camp Bison is served by a mechanically aerated, activated sludge sewage treatment plant with a capacity of 44,000 gpd. The chlorinated effluent is discharged to the Wanapitei River.

TABLE 9 - 13

TOWNSHIP OF LAURA - COMPOSITE SAMPLE RESULTS CAMP BISON S.T.P.

| | | BOD | SUSPENDED SOLIDS |
|---|---|---|---|
| RAW SEWAGE | PPM | 520 | 296 |
| FINAL EFFLUENT | PPM | 50 | 77 |
| EFFICIENCY | % | 90 | 74 |

The discharge exceeds the OWRC objective of 15 ppm. BOD and suspended solids. The poor quality effluent may be attributed to the intermittent nature or organically-strong flows discharged to the plant.

Camp Spruce is served by a septic tank and tile bed system.

Three outfalls were discovered discharging to the Wanapitei River system. Two were from the sewage treatment facilities serving Camp Two and Camp Bison. The third outfall was the effluent ditch from a septic tank serving the dairy, and containing wastes from a stable and slaughter house located at Camp Two.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

1. Consideration should be given to utilizing ground water, or alternatively to providing more refined water treatment at Camp Two.

2. Improved treatment should be provided for the water supply at Camp Bison.

3. An alternate water source should be located for Camp Spruce to insure that sufficient water is available throughout the year.

4. Consideration should be given to increasing storage facilities at all three camps.

V RECOMMENDATIONS FOR POLLUTION CONTROL

The dairy, slaughter house and stables should be connected to the Camp Two sewerage system.

# TOWNSHIP OF LEVACK

## I GENERAL

The unorganized Township of Levack is located in the Onaping River Watershed north-west of the City of Sudbury. It adjoins the Improvement District of Onaping and the Town of Levack.

Presently, the township contains the Strathcona and Longvack Mines operated by Falconbridge Nickel Mines Ltd. Strathcona Mine is under development while Longvack is closed. Approximately 110 men employed by a contractor are developing the mine.

## II WATER SUPPLY

Strathcona Mine obtains water from Strathcona Lake. Chlorine is applied for disinfection and a polyphosphate solution is added for corrosion prevention. The service pump for domestic use is capable of supplying 320,000 gpd while the fire pumps are capable of delivering 720,000 gpd. Consumption figures are not presently available. When production commences at the mine a greater source of water supply will be required. The chemical quality of the water is indicated by the following analyses

TABLE 9 - 14

TOWNSHIP OF LEVACK - STRATHCONA LAKE - STREAM SAMPLES

| DATE | HARDNESS AS CaCO3 (PPM) | ALKALINITY AS CaCO3 (PPM) | IRON AS Fe (PPM) | CHLORIDE AS Cl (PPM) | PH AT LAB. |
|---|---|---|---|---|---|
| MAY 23, 1962 | 100 | 0 | 0.08 | 4 | 5.2 |

The water is acidic but otherwise of satisfactory quality for domestic consumption. Examination of samples has revealed the treated

water to be of satisfactory bacterial quality.

Longvack Mine is presently not operating. Water supply for this operation was obtained from a small stream issuing from Longvack Lake. The supply received chlorination.

III WATER POLLUTION

1. Sanitary Waste Disposal

(a) Present Conditions

A septic tank serves the Strathcona Mine buildings overflowing to a swampy area tributary to the Moose Creek system.

(b) Proposed Treatment Works

No definite proposals have been submitted to treat sanitary wastes for the Strathcona Mine when full production commences.

2. Industrial Wastes

Approximately 20 gpm of mine water waste is pumped to a swampy area, which is tributary of the north branch of Moose Creek.

A more detailed discussion of these operations will be included in Part II of this report to be issued at a later date.

3. Surface Water Quality

The township is drained by the Onaping River, Moose Creek system. Samples taken from the Onaping River and the north branch of Moose Creek below Levack Township indicate the results shown in Table 9-15.

The bacteriological quality of the watercourses leaving the township was satisfactory. The nickel concentration in the north branch of Moose Creek is excessive.

TABLE 9 - 15

TOWNSHIP OF LEVACK - STREAM SAMPLES

| SAMPLING POINT NO. | LOCATION | DATE SAMPLED | 5-DAY BOD (PPM) | SOLIDS TOTAL | SOLIDS SUSP. (PPM) | SOLIDS DISS. | TURBIDITY IN SILICA UNITS | IRON AS Fe (PPM) | COPPER AS Cu (PPM) | NICKEL AS Ni (PPM) | M.F.COLIFORMS COUNT/100 ML. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SVO 110.2 | ONAPING R. ABOVE TOWN OF LEVACK | MAY 29/59 | 1.2 | 40 | 2 | 38 | | | | | 10 |
| | | JUNE 27/60 | 1.0 | 54 | 10 | 44 | | | | | -- |
| | | OCT. 18/60 | 2.2 | 40 | -- | -- | 1 | | | | 63 |
| | | AUG. 16/61 | 1.0 | 48 | -- | -- | 1 | 0.4 | 0.0 | 0.0 | 106 |
| | | JUNE 3/63 | 1.5 | 44 | -- | -- | 0.6 | | | | 124 |
| SVO 113.9 | NORTH BRANCH MOOSE CR. BELOW STRATHCONA MINE | NOV. 14/62 | 1.2 | 322 | -- | -- | -- | 0.65 | -- | 2.8 | 50 |

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

There are no recommendations at this time.

V RECOMMENDATIONS FOR POLLUTION CONTROL

There are no recommendations at this time.

## TOWNSHIP OF NOBLE

I GENERAL

The Township of Noble is located approximately 100 miles north of the City of Sudbury. The population is concentrated at the community of Gogama which is on the CN main line at Minisinakwa Lake. Gogama is on a large sandy plain which supported a fine timber industry until about 1941, when a forest fire destroyed vast timber resources. The Department of Lands and Forests maintains district offices at Gogama and is the main employer in the area. The population is about 500-600.

II WATER SUPPLY

Well points driven in the sand plain to depths of about 8 to 16 feet, supply water for most of the residences and the Department of Lands and Forests offices at Gogama. Taste and odour problems are encountered in the well waters in years with above average precipitation or high lake levels. Some well water samples have shown poor bacteriological quality.

The fine sands near surface in the Gogama area are not suitable for high capacity wells. They should continue to provide adequate water for domestic and commercial use if pollution is controlled.

Six records are available for drilled wells in the community. Only two of these wells indicate the possibility of gravel under the fine surface sand and a thorough geological examination of the area probably culminating in test drilling, would be needed to determine whether or not water-bearing gravels are generally present at depth.

The Department of Lands and Forests is installing a water works system, drawing approximately 11,500 gpd from Minisinakwa Lake. This system will supply chlorinated water mainly to the Department of Lands and Forests buildings.

III WATER POLLUTION

Sewage disposal is accomplished by means of pit privies, cesspools and septic tank systems. The sandy nature of the soil generally allows infiltration of the sewage, but the use of cesspools discharges the septic tank effluent much closer to the water table than the use of tile fields. This practice is likely an important factor in the poor taste and poor bacterial quality of well water under high water table conditions.

A flood in 1960 caused the water table to rise in the horizontal plane of the cesspools. Under these conditions an effective cross-connection exists between the water supply and the sewage disposal works.

IV RECOMMENDATIONS FOR WATER DEVELOPMENT

Consideration should be given to the provision of a communal water works system.

# V RECOMMENDATIONS FOR POLLUTION CONTROL

It is recommended that the septic tank effluent be discharged to tile beds rather than to cesspools.

# APPENDIX

## EXPLANATION & SIGNIFICANCE OF LABORATORY ANALYSES

ALL THE LABORATORY TESTS INCLUDED IN THIS REPORT WERE PERFORMED AT THE ONTARIO WATER RESOURCES COMMISSION LABORATORY IN TORONTO.

## A. BACTERIOLOGICAL EXAMINATION

BACTERIOLOGICAL EXAMINATIONS WERE PERFORMED ON SAMPLES FROM WATER SUPPLIES, STREAMS, AND OUTFALLS. THE MEMBRANE FILTER TECHNIQUE WAS USED TO OBTAIN A DIRECT ENUMERATION OF COLIFORM ORGANISMS. THESE ORGANISMS ARE NORMAL INHABITANTS OF THE INTESTINES OF MAN AND OTHER WARM BLOODED ANIMALS. THEY ARE ALWAYS PRESENT IN LARGE NUMBERS IN SEWAGE AND ARE GENERALLY MINIMAL IN OTHER STREAM POLLUTANTS.

THE RESULTS OF THE EXAMINATIONS ARE REPORTED AS MF COLIFORM COUNT PER 100 ML.

A COLIFORM DENSITY LESS THAN 2,400 ORGANISMS PER 100 ML. IS DESIRABLE IN SURFACE WATERS USED FOR RECREATIONAL PURPOSES. COLIFORM ORGANISMS SHOULD BE ABSENT FROM WATER SUPPLIED FOR HUMAN CONSUMPTION.

## B. STREAM AND OUTFALL SAMPLES

THE CHEMICAL ANALYSES PERFORMED ON STREAM AND OUTFALL SAMPLES INCLUDE DETERMINATION OF BIOCHEMICAL OXYGEN DEMAND, SUSPENDED SOLIDS, TURBIDITY, AND IN SOME INSTANCES, DETERMINATIONS FOR pH, COPPER, NICKEL, IRON AND PHENOL.

### BIOCHEMICAL OXYGEN DEMAND (BOD):

BIOCHEMICAL OXYGEN DEMAND IS REPORTED IN PPM. AND IS AN INDICATION OF THE AMOUNT OF OXYGEN REQUIRED FOR THE STABILIZATION OF DECOMPOSABLE ORGANIC MATTER PRESENT IN SEWAGE, POLLUTED WATERS, OR INDUSTRIAL WASTES. CONSEQUENTLY, THE BIOCHEMICAL OXYGEN DEMAND PRESENT IN THE WASTE WATER DISCHARGE REDUCES AND MAY ELIMINATE THE DISSOLVED OXYGEN CONTENT OF THE RECEIVING STREAM.

A DESIRABLE UPPER LIMIT IN NATURAL WATER IS 4 PPM.

LABORATORY TESTS ARE CONDUCTED OVER A PERIOD OF CONTROLLED INCUBATION. THE TIME AND TEMPERATURE COMMONLY USED FOR THE TEST ARE FIVE DAYS AT 20° C. THESE CONDITIONS WERE USED FOR ALL BOD ANALYSES INCLUDED IN THIS REPORT.

### SOLIDS:

THE ANALYSES FOR SOLIDS USUALLY INCLUDE TESTS FOR TOTAL, SUSPENDED AND DISSOLVED SOLIDS. SUSPENDED SOLIDS INDICATE THE MEASURE OF UNDISSOLVED SOLIDS OF ORGANIC OR INORGANIC NATURE. WHEREAS THE DISSOLVED SOLIDS ARE A MEASURE OF THOSE IN SOLUTION. LAND EROSION, SEWAGE, AND INDUSTRIAL WASTES ARE SIGNIFICANT SOURCES OF SUSPENDED SOLIDS.

THE EFFECT OF SUSPENDED SOLIDS IN WATER ARE REFLECTED IN DIFFICULTIES ASSOCIATED WITH WATER PURIFICATION, DEPOSITION IN STREAMS, AND INJURY TO THE HABITAT OF FISH.

WHERE SUSPENDED SOLIDS VALUES APPROACH 20 PPM. OR LESS, LABORATORY DIFFICULTIES ARE EXPERIENCED AND, EXCEPTING THE SAMPLES FROM SEWAGE TREATMENT WORKS, THE VALUES OF SUSPENDED MATTER ARE USUALLY DETERMINED AS TURBIDITY.

### TURBIDITY:

TURBIDITY IS AN OPTICAL MEASURE OF THE FINE SUSPENDED SOLIDS, SUCH AS SILT AND FINELY DIVIDED ORGANIC MATTER, IN WATER. WHERE SUSPENDED SOLIDS VALUES APPROACH 20 PPM. OR LESS, THE RESULTS ARE USUALLY REPORTED AS TURBIDITY IN SILICA UNITS.

### pH:

THE pH IS AN INDEX OF THE ACIDITY OR ALKALINITY OF THE SOLUTION AS REPRESENTED BY THE INSTANTANEOUS HYDROGEN ION CONCENTRATION. THE PRACTICAL pH SCALE EXTENDS FROM 0, VERY ACID, TO 14, VERY ALKALINE, WITH THE MIDDLE VALUE OF pH 7 CORRESPONDING TO EXACT NEUTRALITY (AT 25°C.). THE OBJECTIVES FOR SURFACE WATER QUALITY AS ADOPTED BY THE OWRC SUGGEST THAT THE pH OF THE WATERS FOLLOWING INITIAL DILUTION, SHOULD NOT BE LESS THAN 6.7 NOR GREATER THAN 8.5.

PHENOLIC COMPOUNDS:

PHENOLS AND PHENOLIC EQUIVALENTS ARE REPORTED IN PARTS PER BILLION AND THOSE VALUES INCLUDED IN THIS REPORT WERE MEASURED BY THE GIBBS METHOD WITH MODIFICATIONS.

PHENOLIC COMPOUNDS ARE PRESENT IN THE WASTE FLOWS FROM MANY INDUSTRIAL PROCESSES. DEPENDANT ON THE CONCENTRATION, THE PRESENCE OF THESE MATERIALS MAY BE TOXIC TO FISH OR MAY TAINT THE FLESH OF FISH. PHENOLS IN VERY MINUTE CONCENTRATIONS WILL COMBINE WITH CHLORINE TO PRODUCE INTENSE TASTES AND ODOURS.

AS AN OBJECTIVE, THE CONCENTRATION OF PHENOLS, OR PHENOL EQUIVALENTS SHOULD NOT EXCEED 5 PPB. AT ANY POINT IN RECEIVING WATERS SUBSEQUENT TO INITIAL DILUTION.

METAL IONS:

METAL IONS IN WATER ARE HIGHLY TOXIC TO FISH AND OTHER LIFE. COPPER IS OF PARTICULAR IMPORTANCE IN THIS REGARD AS IT MAY BE TOXIC TO FISH IN SOFT WATER AT 0.02 PPM. EFFECTS MAY ALSO BE NOTED IN THE GROWTH OF ALGAE AT SIMILAR LOW DILUTIONS. NICKEL IS ACUTELY TOXIC TO FISH AT ABOUT 10 PPM. IT SHOULD ALSO BE NOTED THAT THE TOXIC EFFECTS OF VARIOUS HEAVY METALS TO FISH ARE GENERALLY ADDITIVE AND SOME TIMES SYNERGISTIC.

## C. WATER SUPPLIES

THE CHEMICAL ANALYSES PERFORMED ON WATER USED AS A SOURCE OF SUPPLY FOR MINICIPAL OR PRIVATE SYSTEMS INCLUDE; HARDNESS, ALKALINITY, CHLORIDES, IRON, FLUORIDE, pH, TURBIDITY, AND COLOUR.

HARDNESS:

NO SPECIFIC LIMIT IS USUALLY PLACED ON HARDNESS ALTHOUGH IT IS USUALLY RECOMMENDED THAT WATERS FOR DOMESTIC USE SHOULD CONTAIN LESS THAN 250 PPM. HARDNESS AS CaCO3. THIS RECOMMENDED LIMIT HAS BEEN USED TO AVOID EXCESSIVE SOAP CONSUMPTION AND OTHER PROBLEMS, PRIMARILY ECONOMIC, USUALLY ASSOCIATED WITH HARD WATER. THE DEGREES OF HARDNESS ARE INDICATED AS:

| | |
|---|---|
| SOFT - | 0-60 PPM. AS CaCO3 |
| MODERATELY HARD - | 61-120 PPM. AS CaCO3 |
| HARD - | 121-180 PPM. AS CaCO3 |
| VERY HARD - | GREATER THAN 180 PPM. AS CaCO3 |

ALKALINITY:

ALKALINITY OF NATURAL WATERS IS DUE TO THE PRESENCE OF SALTS OF WEAK ACIDS, USUALLY BICARBONATES. THE CONCENTRATION IS REPORTED IN PPM. AS CaCO3 AND IS SIGNIFICANT IN DETERMINING AGGRESIVE TENDENCIES AND SOFTENING TREATMENT.

CHLORIDES:

CHLORIDES ARE NATURALLY PRESENT, IN VARYING CONCENTRATIONS, IN WATER SUPPLIES. INCREASING CHLORIDE CONCENTRATION MAY INDICATE CONTAMINATION FROM DOMESTIC SEWAGE.

THE RECOMMENDED MAXIMUM CONCENTRATION TO AVOID SALINE TASTES IS 250 PPM.

IRON:

THE RECOMMENDED MAXIMUM LIMIT FOR IRON IN WATER SUPPLIES IS 0.3 PPM. IT IS NOTED THAT WATERS WITH CONCENTRATIONS OF IRON IN EXCESS OF 0.3 PPM. ARE NOT HARMFUL TO CONSUMERS BUT HAVE OBJECTIONABLE STAINING AND SEDIMENT-FORMING PROPERTIES, AND MAY CAUSE THE DEPOSITION OF IRON IN PIPES OR THE GROWTH OF IRON BACTERIA. IF THE CONCENTRATION EXCEEDS 1 PPM., PROBLEMS WITH METALLIC TASTE MAY OCCUR.

FLUORIDE:

FLUORIDE MAY OCCUR NATURALLY IN WATER OR IT MAY BE ARTIFICIALLY APPLIED AT THE SUPPLY AND/OR TREATMENT WORKS.

A FLUORIDE CONCENTRATION OF APPROXIMATELY 1 PPM. IS CONSIDERED BENEFICIAL IN THE PREVENTION OF DENTAL CARIES. THE RECOMMENDED MAXIMUM AND MINIMUM LIMITS OF FLUORIDE ARE 1.2 PPM. AND 0.8 PPM. RESPECTIVELY.

TURBIDITY:

THE SIGNIFICANCE OF TURBIDITY IS INCLUDED IN SECTION B.

THE TURBIDITY OF TREATED WATER SHOULD NOT EXCEED 5 SILICA UNITS.

COLOUR:

THE COLOUR INTENSITY OF WATER IS REPORTED IN HAZEN UNITS.

THE COLOURATION OF NATURAL WATER MAY RESULT FROM CONTACT WITH ORGANIC MATTER OR CHEMICAL SUBSTANCES.

THE RECOMMENDED MAXIMUM COLOUR CONTENT IS 15 HAZEN UNITS.

DISTRICT OF ALGOMA

DISTRICT OF NIPISSING

DISTRICT OF MANITOULIN

TP 115 TP 114 TP 108 TP 120 TP 107 TP 119 TP 118

CRAIG MONCRIEFF HESS HARTY FOY BOWELL WISNER NORMAN WANAPITEI LAKE RATHBUN KELLY McNISH

HART CARTER LEVACK MORGAN LUMSDEN HANMER CAPREOL MACLENNAN SCADDING DAVIS JANES

ACHESON ERMATINGER CASCADEN ONAPING BALFOUR CHELMSFORD DOWLING RAYSIDE BLEZARD GARSON FALCONBRIDGE STREET LOUGHRIN HENRY

BIGELOW VERNON TOTTEN TRILL FAIRBANK CREIGHTON SNIDER SUDBURY COPPER CLIFF NEELON DRYDEN AWREY HAGAR RATTER

DUNLOP PORTER HYMAN DRURY DENISON GRAHAM WATERS BRODER DILL CLELAND HAWLEY APPLEBY DUNNET

GOUGH SHAKESPEARE BALDWIN NAIRN LORNE LOUISE WHITEFISH LAKE INDIAN RESERVE No. 6 EDEN TILTON SECORD BURWASH HENDRIE JENNINGS CASIMIR

SALTER MAY HALLAM FOSTER TROMAN DIEPPE CAEN BEVIN HALIFAX LAURA SERVOS KOSKIN CHERRIMAN HADDO

MASSEY MERRITT

HARROW MCKINNON MONGOWIN CURTIN ROOSEVELT STALIN GOSCHEN SALE ATLEE WALDIE COX DELAMERE COSBY MARTLAND

KILPATRICK STRUTHERS ALLEN BIGWOOD

NORTH CHANNEL (LAKE HURON)

LEGEND

- SAMPLING POINT SHOWING STREAM AND MILEAGE
- STREAM AND MILEAGE AT OUTFALL
- TYPE OF OUTFALL
  - I INDUSTRIAL
  - M MUNICIPAL
  - C COMBINED SEWER
  - T TYPE EFFLUENT
- DISTRICT BOUNDARY
- TOWNSHIP BOUNDARIES
- MUNICIPAL BOUNDARIES
- WATERSHED BOUNDARIES

SUDBURY DISTRICT

KEY PLAN

■ AREA COVERED WITH THIS MAP

ONTARIO WATER RESOURCES COMMISSION

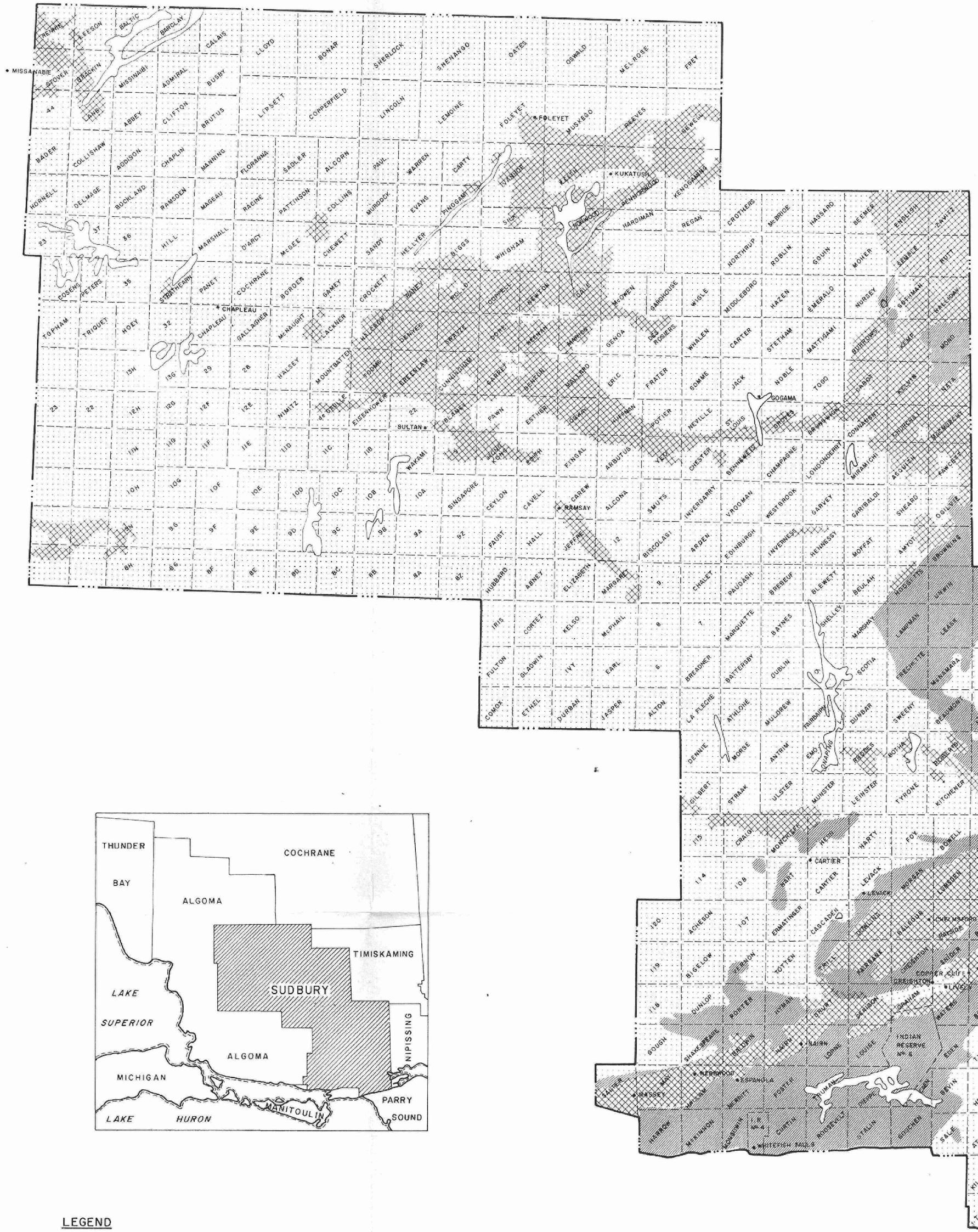
# DISTRICT OF SUDBURY

## DRAINAGE PLAN (SOUTHERN PART)

SHOWING STREAM SAMPLING POINTS

FIGURE 2-18

| | |
|---|---|
| SCALE : | MI |
| DRAWN BY : R.W. | DATE : MAY 1965 |
| CHECKED BY : | DRAWING No. 65-185 |







## LEGEND

- PROTEROZOIC — SEDIMENTARY ROCKS AND BASIC INTRUSIVES
- ARCHEAN — ACID INTRUSIVES AND GRANITIC GNEISSES WITH SEDIMENTARY BANDS
- ARCHEAN — SEDIMENTARY AND VOLCANIC ROCKS AND DERIVED METAMORPHIC EQUIVALENTS

ONTARIO WATER RESOURCES COMMISSION

WATER RESOURCES SURVEY

# DISTRICT OF SUDBURY

SHOWING THE BEDROCK GEOLOGY

FIGURE 3-1

SCALE : 0 10 20 30 MI.

| | |
|---|---|
| DRAWN BY: R.W. | DATE: JUNE 1963 |
| CHECKED BY: | DRAWING No. 63-179 |

WEBFOOT LAKE

LONGVACK MINE

STRATHCONA LAKE

STRATHCONA MINE

SVOMN-113.9

PIKE LAKE

TWP. OF LEVACK
TOWN OF LEVACK

LEVACK MINE TAILINGS AREA

TWP. OF LEVACK
ONAPING I.D.

SVOMG-111.8 I

DAM

GRASSY CR.

ONAPING RIVER

SVOMN-112.3 I

SVOMN-112.2 I

SVOMN-112.2 S

FECUNIS MINE

TAILING AREA

SVOM-111.4

LEVACK MINE

SVOM-111.3 TS

SVOMG-111.3

MOOSE CR.

LEVACK

MOOSE CR.

SVOM-115.8 T

DAM

MOOSE LAKE

WATER LINE TO FECUNIS MINE

TWP. OF LEVACK
ONAPING I.D.

SVO-110.2

SVOM-113.0

HILLCREST CAMP

PUMP HOUSE FOR FECUNIS MINE & MILL

SVOMG-110.4

HARDY MINE TAILING AREA

DAM

DAM

DAM

MOOSE LAKE

SVO-109.8

SVOM-109.7

SVOGP-109.3 I

ONAPING MINE

GILL POND

LODGE

HARDY MINE

SVO-109.4

SVO-109.3 I

PYRRHOTITE STORAGE

DAM

SVOGP-108.8

HIGH CLIFF LAKE

SWAMP AREA

S.T.P.

HARDY SPUR RWY

CAMPBELL LAKE

ONAPING TOWNSITE

IMPROVEMENT DISTRICT OF ONAPING

DOWLING TWP.

## LEGEND

SVOM-113.0 – SAMPLING POINT SHOWING STREAM AND MILEAGE

SVOGP-109.3 I – STREAM AND MILEAGE AT OUTFALL
– TYPE OF OUTFALL
I – INDUSTRIAL
S – UNTREATED SEWAGE

——— MUNICIPAL AND I.D. BOUNDARIES

| ONTARIO WATER RESOURCES COMMISSION | |
|---|---|
| MUNICIPAL BOUNDARIES OF ONAPING I.D., TOWN OF LEVACK, ONAPING TOWNSITE AND LOCATION OF HARDY, ONAPING, FECUNIS, STRATHCONA AND LEVACK MINES<br>FIG. 8-1 | |
| SCALE 1" = 22 CHS APPROX | |
| DRAWN BY J.H | DATE JUNE 1959 REVISED JUNE 1963 |
| CHECKED BY | DRAWING NO |

APPROX. 15000 FT. TO WHITSON LAKE PUMPHOUSE

SVJF(N)-88.3 I

STOBIE MINE

SVJF(N)-88.3 S

CITY LIMITS

SVJF-89.4 I

FROOD MINE

SVJF-89.4 S

FROOD BRANCH

SVJF-86.7

SVJ-89.3

JUNCTION CREEK

C.N.R.

MALLEY DRIVE WELL

APPROX. 5000 FT. TO PUMP LAKE PUMPHOUSE

WATER SUPPLY LINE

MURRAY MINE

SVJN-88.2 T

STAND PIPE 1.5 M.G.

SHAFT No 6

SECOND AVE. WELL

SVJN-87.7

LADY MACDONALD LAKE

COPPER CLIFF NORTH MINE

NOLIN CREEK

PEARL ST. ELEVATED TANK, 1 M.G.

SVJ-81.2

SVJR-84.8

MINNOW LAKE

CITY LIMITS

ASH ST. ELEVATED TANK 0.5 M.G.

SVJ-83.0

TOWN OF COPPER CLIFF

OLD STP

SVJ-82.4

SHAFT No 4

CITY INTAKE

SVJR-84.0 D

SVJR-85.0 D

SVJR-86.1 D

SVJR-86.2 D

SVJR-85.3 D

SVJR-85.8

SVJR-86.4

SVJR-86.8

SUDBURY & ALGOMA SANATORIUM

STP

SVJRP-86.7 T

SVJRP-85.4

RAMSAY LAKE

ST. DAVID ST. PUMPHOUSE

SHAFT No 3

SHAFT No 2

COPPER CLIFF CREEK

SVJL-81.9

SVJ-81.1

LILY CREEK

SVJ-80.9 S

SVJ-80.2

SHAFT No 1 AND MAIN SEWAGE LIFT STATION

SVJ-80.3 S

SVJRT-85.7

TROUT LAKE

ROBINSON LAKE

KELLY LAKE

SVJR-79.9

PIKE LAKE

SVJRM-87.0

MUD LAKE

## LEGEND

- AREAS SERVICED BY WATER
- WATER & SEWERS
- NIGHT SOIL COLLECTION
- X SERVICED BY WATER: SANITARY SEWERS ARE CONSTRUCTED AND EXPECTED TO BE IN OPERATION LATE IN 1963
- (11) SEWAGE LIFT STATION
- S.T.P. SEWAGE TREATMENT PLANT
- SVJ-80.6 SAMPLING POINT SHOWING STREAM AND MILEAGE
- SVJF-89.4 T STREAM AND MILEAGE AT OUTFALL

TYPE OF OUTFALL
D — DITCH
I — INDUSTRIAL
S — UNTREATED SEWAGE
T — S.T.P. EFFLUENT

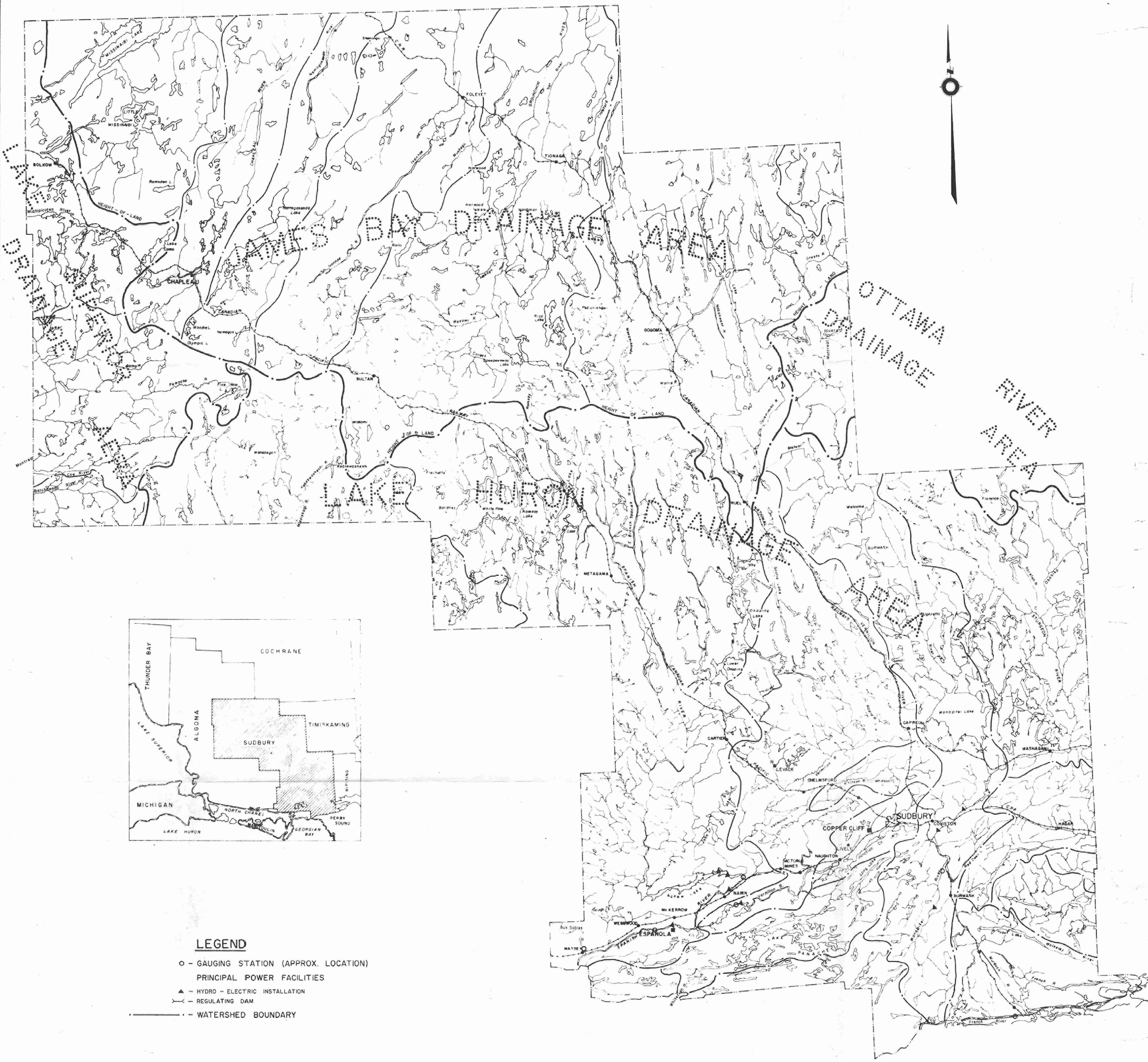
ONTARIO WATER RESOURCES COMMISSION

# CITY OF SUDBURY

## WATER SUPPLY AND WASTE WATER DISPOSAL

FIG. 5-1

| | |
|---|---|
| SCALE 1" = 2000' | |
| DRAWN BY O.F. | DATE JUNE 7/63 |
| CHECKED BY | DRAWING NO 63-178 |







## LEGEND

- o – GAUGING STATION (APPROX. LOCATION)
- PRINCIPAL POWER FACILITIES
- ▲ – HYDRO – ELECTRIC INSTALLATION
- ⊢< – REGULATING DAM
- ——— · – WATERSHED BOUNDARY

FIGURE 2–IA

# SUDBURY DISTRICT

## DRAINAGE PLAN

SCALE 0 4 8 16 Miles

OWRC. TORONTO JUNE 7, 1963 – S.H.

DWG. No. 60-78.